WATCH LIST: SENSITIVE, BUT NOT CRITICALLY

Under this heading are discussed taxa which are known or have been reported to occur in the Interior Columbia Basin; are known to have lost much of their range; and are regarded as Sensitive species, *i.e.,* especially associated with mature, relatively undisturbed forests; riparian areas; springs; and/or some combination of specialized or especially impacted habitat. However, these taxa may have had a comparatively broad range originally; or may be species which currently known or thought to be common outside the area of assessment elsewhere in the US or in adjacent countries. Alternatively, these may be species about which there is insufficient information as to allow confident status assessment. These taxa are not regarded as in imminent danger of extinction without protection currently (although this may change rapidly, depending upon the management strategy adapted for public lands, and upon the effectiveness of its implementation).

These taxa should be regarded as Sensitive by land management and wildlife planners, and their status should be carefully and periodically reviewed. Complacency in regard to their status and needs is *not* suggested.

Land Snails

Oreohelix jugalis (Hemphill, 1890)
boulder pile mountainsnail

Type locality: "Salmon River Mountains, Idaho"; lectotype ANSP 62372a; for possible paralectotypes, see Coan & Roth (1987) and Frest & Johannes (1995a). Hemphill's lots often contained specimens of what we here term *Oreohelix* n. sp. 23.

Description: The best previous description and illustrations are those of Pilsbry (1939); but see also Solem (1975) for anatomy and Frest & Johannes (1995a). This is a large taxon (diameter often 25 mm or more at 6 whorls) with strongly depressed, very low conoidal spire (note that Pilsbry, 1939, fig. 322 a-b represent this species, but that 322c does not: see *Oreohelix* n. sp. 23 above); open, rather wide umbilicus contained about 4 1/2 times in the full diameter; shell generally thick; white groundcolor with small pinkish- or grayish-brown streaks; typical two color bands thin but sharp, cinnamon-brown; sculpture of irregular and weak growth lines, rather widely separated; cut by spiral lines above and peripherally (rarely below); whorls convex, rounded periphery but with slight angulation to the aperture; oval aperture, moderately oblique, weakly shouldered, commonly slightly expanded and deflected.

The original description was as *Patula strigosa* var. *jugalis* Hemphill, 1890; a later name was *Oreohelix strigosa jugalis* Hemphill, Henderson, 1924. Species status dates to Pilsbry (1933)

Discussion: The taxon somewhat resembles the Lucile mountainsnail (*Oreohelix* n. sp. 23) superficially but is much more depressed and has more slowly expanding whorls: anatomically, these two taxa are not closely related. Closest affinities are with *Oreohelix* n. sp. 26 and with *Oreohelix junii*; for comparisons, see those entries above and key 1Q (**APPENDIX A**).

Ecology: This species occurs at low elevations in rock taluses (schist; basalt; metasediments; limestone) and boulder piles (mixed lithologies). This is a rather tolerant species, occupying the range from slightly mesophile to moderately-strongly xerophile. Sites are open, vary in exposure, and can be seasonally dry. Plant associates include *Celtus*, *Rhus*, *Salix*, *Sorbus*, and *Cornus stolonifera*, as well as grasses and a few bryophytes. Common associates include *Allogona ptychophora ptychophora*, *Allogona ptychophora solida*, *Cryptomastix harfordiana*,

and such *Oreohelix* species as *Oreohelix vortex*. The species is found occasionally with such species as *Oreohelix waltoni* and several of the new taxa described above.

Original distribution: Limited to the area along the lower Salmon River from Riggins to about RM 20, mostly in Idaho County, Idaho.

Current distribution: Still survives at a fair number of sites in the original range, including some on BLM lands. See Frest & Johannes(1995a) for a recent assessment and map.

Idaho distribution and comments: A lower salmon endemic (and, of course, Idaho endemic as well), found with detailed survey to have been more common tan Solem (1975) believed, but still quite limited.

Specific Idaho sites: LSR 12, 14, 15, 21, 32, 37, 38, 41, 42, 67, 69, 100, 104-106, 109, 117, 127, 135, 138-140, 163, 186, 190, 209, 213 (27 live sites).

Threats: Nearly all known sites are impacted by grazing; sheep, horses, and cattle have considerably reduced or even extirpated sites. Road construction and maintenance have considerably reduced sites along US 95, and probably extirpated the species from much of the corridor, judging by still-common dead shells. Talus mining, especially for basalt gravel, has affected taluses in the immediate vicinity of all sites. Large sites near White Bird have been completely eliminated (in 1991 and 1994) from talus mining and road improvements. Road corridors are selectively located in preferred habitat of this species. Gold mining and prospecting impacts sites in schist lithologies. Boulder piles along the Salmon River are mostly disturbed by gold mining, and there is little indication that this species has reoccupied mining discard heaps and similar sites, even though some are quite old. Population trends (number of sites, number of individuals) are very clearly downward.

Criteria for inclusion: Local endemic; occurrence on public lands; habitat decline; loss of historic sites.

Recommended status: Until recently, this species was a C2 federal candidate (USFWS, 1994a). With thorough survey, it has been noted as more common than originally expected, even though quite limited and though it has suffered considerable range and site loss (Frest & Johannes, 1995a). Assuming that sites for other, more rare species in the same corridor can be protected, it is possible that this species will be included on enough as to not warrant listing. The species should minimally be considered Sensitive by the Forest Service, BLM, and other appropriate land management and wildlife agencies. If other species are not protected then this taxon should be federally listed as Threatened.

References: Hemphill (1890a); Pilsbry (1939); Solem (1975); USFWS (1994a); Deixis collections, 1988-1994.

Polygyrella polygyrella (Bland & Cooper, 1861)
humped coin

Type locality: Eastern slope of the Coeur d'Alene Mountains, Sanders County, Montana (likely in Lolo National Forest currently). Location of holotype uncertain; some Bland specimens in USNM.

Description: For best descriptions and illustrations, see Pilsbry (1939); see also illustration in Burch & Pearce (1990). Shell discoidal, diameter commonly about 12 mm at 8-8 1/2 whorls; spire very low but often slightly convex; whorls rapidly expanding, narrow; umbilicus well-like, about 1/3 full diameter; expanded in last whorl; shell pale greenish yellow, rather thin, ornamented above by strong, narrow, numerous radial ribs; smooth below; periphery well-rounded, barely supramedian. Aperture lunate-triangular, slightly reinforced, not descending, white; pariety with single prominent erect, triangular lamella; one or two radial rows of three narrow, white, axially elongate lamellae visible in last whorl, arrayed from base to periphery.

Discussion: Pilsbry (1939) discusses color and size variation in this taxon in some detail. Ancey (1887) segregated some Montana specimens as "var. *montanensis*": but specimens we have examined give little or no warrant.

Originally described as *Helix polygyrella* Bland and Cooper, 1861; a later name is *Helix* (*Polygyrella*) *polygyrella* Bland & Cooper, Binney & Bland, 1869.

Ecology: Found generally in moist Douglas fir and spruce forests, often in association with rock outcrops. Substrate is quite variable, and can include basalt, schist, and limestone. Partly open forest with a rich understory, including diverse forbs, mosses, and deciduous shrubs, is common; the best colonies occur in forested taluses. Moist valley, ravine, gorge, or talus sites are preferred, *i.e.* low on a slope and near permanent or persistent water, but not normally subject to regular or catastrophic flooding. Persistence of moisture is a *desideratum*. Land snail associates include such forms as *Allogona ptychophora ptychophora*; *Allogona lombardii*; mesophile-slight xerophile *Oreohelix* species; mesophile *Cryptomastix* species, including *mullani mullani*; *Zacoleus idahoensis*, and *Hemphillia camelus*. This species is a mesophile, but can tolerate moderately xerophilic conditions in rock taluses. This species often occurs with quite rare and endemic mesophile-weakly xerophile taxa, such as *Anguispira nimapuna* and *Cryptomastix magnidentata*.

Original distribution: In Montana, generally in the Clark Fork River drainage, Bitterroot Range and Coeur d'Alene Mountains; in Idaho, in the Coeur d'Alene River drainage (Kootenai County); the Clearwater, Lochsa, and Selway drainages (Nez Perce, Idaho counties); and also in the Blue Mountains (Walla Walla County, Washington; Umatilla County, Oregon).

Current distribution: T. Burke (pers. comm., 1994) has not found this species in northeastern Washington; nor have we. Recent attempts to recollect the Blue Mountain localities were also unsuccessful. This species is known from very few Montana sites (R. B. Brunson, pers. comm., 1993). Old sites were in Clearwater National Forest, Nez Perce National Forest, Nez Perce Tribe lands, Lolo National Forest, possibly Kaniksu National Forest; and the Panhandle National Forests. For extant lower Salmon River sites, see Frest & Johannes (1995a). We have (1991, 1994) unsuccessfully tried the old sites in the vicinity of Coeur d'Alene, Cataldo, and Old Mission. The Mission Creek site is still viable, though threatened by quarry expansion (see discussion under *Cryptomastix magnidentata* above). For another old site, see Branson, Sisk, & McCoy (1966).

Idaho distribution and comments: Idaho originally constituted about 1/3 of the historic range. We are uncertain of the survival of the Oregon sites; and the Montana sites need recent revisit due to heavy logging pressure. The Idaho sites are the best known by far. This taxon inhabits portions of the Clearwater and lower Salmon drainage. Colonies are characteristically widely separated and small; and the whole family may have an essentially relict distribution.

Specific Idaho sites: LSR 99, 102, 103; others outside this region include 1525, 1574.

Threats: Logging and grazing over most of known and potential range; the species is restricted to rather moist sites, generally in exceptionally botanically diverse and intact forests. Logging of relatively intact moderate-elevation Douglas fir forest; grazing of much of the logged terrain; highway construction and other river right-of-way impacts; severe forest fires. This species was probably once very common and widespread. It has lost most of its habitat and most historic sites; but a fair number of other sites probably remain viable. We have found it only very locally abundant.

Criteria for inclusion: This species is definitely declining in terms of remaining habitat and population size. Some old sites are known to be extirpated. Most historic sites are on federal lands, including Nez Perce National Forest, Clearwater National Forest, the Idaho Panhandle National Forests, and Umatilla National Forest. Sites occur on Nez Perce Tribe and BLM lands as well. See Frest & Johannes (1995a) for lower Salmon River occurrences. Because this taxon originally had a rather extensive range, and because we have not had the opportunity to recheck all old sites, we are not recommending listing at present. One should note, however, that the whole family or subfamily to which it belongs (Ammonitellinae [=Megomphicidae]) is rare and thought to have a relict distribution. Several members of this group are either federal listing candidates or have been suggested for listing,

including members of all other ammonitellinid (=megomphicid) genera (*Megomphix*, *Ammonitella*, *Polygyroidea*, and *Glyptostoma*).

Recommended status: We do not recommend federal or State (Washington, Oregon, Idaho, Montana) listing at this juncture; however, it should be regarded as a Sensitive species by Forest Service, BLM, and other land management and wildlife agencies.

References: Pilsbry (1939); Frest & Johannes (1995a); Deixis collections, 1988-1994.

Radiodiscus (*Radiodomus*) *abietum* Baker, 1930
fir pinwheel

Type locality: Near the mouth of the East Fork of the Weiser River, on Stevens Ranch, Adams County, Idaho. Holotype ANSP 149979a; paratypes 149979.

Description: See Baker (1930) and Pilsbry (1948) for description and illustrations. This is a small taxon (6.7 mm at 5 3/4 whorls) with subdiscoidal shell (spire very close to flat); periphery broadly angulate, above the median point of the whorl; thin, light chocolate-brown or reddish-brown shell; whorls slowly and evenly increasing; adult sculpture of thin, low, sharp periostracal ridges parallel to growth lines, with interspaces ca. 2-3 times as wide as ribs; aperture simple, not expanded or reinforced, slightly oblique, crescentic; umbilicus narrow, steep-walled, contained about 6.1 times in full diameter.

Discussion: This species is much larger, and has a comparatively smaller umbilicus, than the Southwestern *Radiodiscus millicostatus*. Anatomy of the two nominal subgenera is rather different, and each is monotypic. It should perhaps be noted here, as previously by Alan Solem, that *Radiodiscus hubrichti* Branson, 1973 is merely a synonym of *Striatura pugetensis* Dall, 1895 and has nothing to do with *Radiodiscus*, which it does not particularly resemble.

Ecology: Generally found in rather moist, rocky forested terrain, at medium-high elevations. Most often, the dominant vegetation is *Pseudotsuga menziesii* forest, with a rich understory including many forbs, deciduous shrubs, and bryophytes. The species has also been found in *Thuja* stands. Moist valley, ravine, gorge, or talus sites are preferred, *i.e.* low on a slope and near permanent or persistent water, but not normally subject to regular or catastrophic flooding. Persistence of moisture is a *desideratum*. The regolith is variable, ranging from basalt to schist to limestone. Common associates include *Allogona ptychophora ptychophora*, *Cryptomastix mullani* subspp. and other *Cryptomastix* spp., larger mesophile *Oreohelix* spp., *Polygyrella polygyrella*, and slugs such as *Hemphillia camelus* and *Zacoleus idahoensis*. A mesophile species, apparently feeding on partly decayed leaves and organic debris in soil.

Original distribution: Old sites for this species included the Blue Mountains, Washington and Oregon; a string of western Idaho and Idaho Panhandle counties (Bonner, Kootenai, Shoshone, Clearwater, Nez Perce, Idaho, and Adams); extreme northeastern Washington (Ferry County: T. Burke, pers. comm., 1994); and part of northwestern Montana (Lincoln, Sanders, Lake, Mineral, Ravalli, & Missoula counties; Brunson & Russell, 1967). River valleys involved included the upper Weiser, Little Salmon, Salmon, Hells Canyon, Coeur d'Alene, St. Joe, Clearwater, Lochsa, Selway [all Snake tributaries), Flathead, Kootenai, Clark Fork, and Bitterroot. Sites on public lands include ones in Payette, Nez Perce, Clearwater, and the Panhandle National Forests.

Current distribution: Known to survive at several sites in northeastern Washington (T. Burke, pers. comm., 1994); we have unsuccessfully rechecked most of the old Idaho sites, finding it extirpated in all but one. On the other hand, we have collected this species in several sites recently; mostly remnant moist forest patches at moderate elevations. Some notion of relative rarity can be gauged from the Lower Salmon River study (Frest & Johannes, 1995a); we found this species at very few sites.

Idaho distribution and comments: In Idaho, this species probably originally inhabited the northern half of the state, including the whole Panhandle and greater Salmon drainages; it could also have a limited distribution further in the western part of the state. However, recent finds have been rather few.

Specific Idaho sites: LSR 180; elsewhere, 1388.

Threats: Logging of relatively intact moderate-elevation Douglas fir forest; grazing of much of the logged terrain; highway construction and other river right-of-way impacts; severe forest fires. This species was probably once very common and widespread. It has lost most of its habitat and most historic sites; but a fair number of other sites probably remain viable. We have found it nowhere abundant.

Criteria for inclusion: Regional endemic; mature forest species; occurrence on public lands; riparian associate.

Recommended status: Formal Federal or State (Washington, Oregon, Idaho, Montana) listing is probably unnecessary at this point. However, this species should be considered Sensitive by Forest Service, BLM, and other appropriate federal and state land management and wildlife agencies.

References: Baker (1930); Pilsbry (1948); Brunson & Russell (1967); Frest & Johannes (1995a); Deixis collections, 1988-1994.

Slugs

Zacoleus idahoensis Pilsbry, 1903
sheathed slug

Type locality: Meadows, Washington County, Idaho; holotype ANSP 87493a.

Description: See Pilsbry (1903, 1948) for best description and illustrations; see also illustration in Burch & Pearce (1990). A small or moderate-sized slug (to 25 mm length) with a weakly keeled tail and posterior pneumostome; sole narrow, tripartite, yellowish-white; groundcolor medium to dark gray or olive-gray, with the mantle and dorsal sides darker than the lower portions of the body (often nearly black); reticulations weak, longitudinal grooves numerous, slightly better developed than transverse.

Discussion: The known range of this slug is from northern and western Idaho to western Montana. We have rarely collected this taxon; but thus far have not revisited many of the old sites for it. Its current status requires further investigation.

Ecology: This species is a moderate mesophile-notophile, which can sometimes be found also in somewhat more xeric sites. Most sites are in relatively intact and florally diverse forests, generally Douglas fir, spruce, or Ponderosa pine, with a rich understory including many forbs and bryophytes. It most often occurs at moderate-high elevations. At high elevation sites, forests may be more open, and nonvascular plants a more significant component of the flora. Moist valley, ravine, gorge, or talus sites are preferred, *i.e.* low on a slope and near permanent or persistent water, but not normally subject to regular or catastrophic flooding. Persistence of moisture is a *desideratum*. It has been noted with many other land snail and slug species, including *Hemphillia camelus*, *Magnipelta mycophaga*, *Allogona ptychophora ptychophora*, *Allogona lombardii*, *Polygyrella polygyrella*, various *Cryptomastix* species, including *mullani mullani*; *Anguispira kochi occidentalis*; and *Anguispira nimapuna*.

Original distribution: Lower Salmon-Little Salmon River drainage, Clearwater (including Lochsa and Selway) River drainage, Coeur d'Alene (including St. Joe) River drainage, Washington, Adams, Idaho, Bonner, Kootenai,

Shoshone, and Clearwater counties, Idaho; Clark Fork River drainage, Sanders County, Montana. Old sites are in the Idaho Panhandle National Forests, Clearwater National Forest, Nez Perce National Forest, Payette National Forest, and Lolo National Forest, as well as on BLM and other lands in this same region.

Current distribution: Still occurs at scattered sites in the original distribution. For lower Salmon River sites, see Frest & Johannes (1995a). Collected recently (1988-1994) also at a few sites in the Lolo Pass area; Coeur d'Alene drainage; and Clearwater drainage.

Idaho distribution and comments: The northern half of the state (Washingtonian Province areas) originally constituted about one-half of the species' range but most of the known sites.

Specific Idaho sites: LSR 172, 175.

Threats: Logging and grazing over most of known and potential range; the species is restricted to rather moist sites, generally in exceptionally botanically diverse and intact forests. Logging of relatively intact moderate-elevation Douglas fir forest; grazing of much of the logged terrain; highway construction and other river right-of-way impacts; severe forest fires. This species was probably once very common and widespread. It has lost most of its habitat and most historic sites; but a fair number of other sites probably remain viable. We have found it only very locally abundant. It is less sensitive than the more clearly notophile slug genera, such as *Prophysaon* and *Hemphillia*.

Criteria for inclusion: Local endemic; occurrence on public lands; loss of historic sites; loss of most habitat.

Recommended status: This slug has none at present. It should be considered a Sensitive species by the Forest Service, BLM, and other federal and state land management and wildlife agencies, *e.g.,* in Idaho and Montana. However, enough sites are likely to exist as to not require federal listing at this time.

References: Pilsbry (1903, 1948); Frest & Johannes (1995a); Deixis collections, 1990-1994.

Freshwater Snails

Colligyrus greggi (Pilsbry, 1935)
Rocky Mountain duskysnail

Type locality: Spring in Cliff Creek Canyon, Teton County, Wyoming; holotype ANSP 163812a.

Description: This hydrobiid has a small, moderately high conic shell with weakly convex but shouldered whorls; nearly or barely closed umbilicus; and has a dark gray body, black visceral coil, and dark male external genitalia (both lobe and filament pigmented); the paucispiral operculum is peripherally slightly yellowish-colorless; the attachment area is often orange or orange-brown. The most closely related forms may be such eastern species as *Lyogyrus walkeri* and some western endemics such as *Lyogyrus* n. sp. 1, *Lyogyrus* n. sp. 6, and *Lyogyrus* n. sp. 7. For comparisons with other western US amnicolinids, see key 2H (**APPENDIX A**). Hershler (1999) ascribes this taxon, long known as *Lyogyrus greggi*, to the genus *Colligyrus*, based in part upon anatomical criteria.

Discussion: Taylor (1966a, 1985a) reports this species from sites in western Montana, southeastern Idaho, southwestern Wyoming, and possibly northeastern Utah. We segregate some of these as separate species herein; but still recognize *greggi* from much the same range.

Ecology: A crenocole species, found mostly in small to medium-sized springs. Substrate is generally coarse: this species, like many western "*Lyogyrus*", is a lithophile and perilithon feeder. Common macrophytes include

Rorippa, *Veronica*, and *Mimulus*. This species is less common in deeper springs and spring pools; and is either rare in or absent from nutrient-enriched settings (generally absent). Often, this is the only hydrobiid and most common mollusk present.

Original distribution: Taylor (1966a) cites localities in southwestern Montana, southeastern Idaho, and western Wyoming (Snake River, Bear River, and Clark Fork River drainages). Hershler (1999) gives a somewhat similar range, including a few northeastern Utah populations.

Current distribution: Uncertain. We are currently working on this and related species with R. Hershler. The species is quite rare in Wyoming and Montana. Southeastern Idaho sites may be relatively more common, but confusion with other undescribed "*Lyogyrus*" species (as discussed above) has to be resolved. Other sites in northeastern Utah and northern Idaho are perhaps referable to this species. We are currently (together with R. Hershler) systematically surveying southeastern Idaho and adjacent areas for this and other mollusk taxa. It is quite possible that this is a complex of several similar-appearing species, each of which is rather circumscribed in its distribution and in need of protection.

Idaho distribution and comments: Almost all of Idaho except for the Snake River Plain may have this taxon; this represents most of the known sites and perhaps 70% of the total range, which includes western Wyoming and southwestern Montana.

Specific Idaho sites: See Hershler (1999); but sites I accept are: 859, 861, 862, 872, 875, 876, 951, 961, 965, 981, 982, 986-988, 1165, 1167, 1184, 1188, 1189, 1192, 1197, 1221, 1222, 1224, 2027, 2032, 2037, 2039, 2041, 2048, 2053, 2054, 2057-2059, 2085, 2094, 2099-2101, 2105, 2116, 2117, 2121-2124

Threats: Much of the middle and upper Snake River in Idaho and Wyoming is rapidly becoming eutropified, due to agricultural runoff, fish farms, and urbanization along the river corridor. Much of the river is impounded behind a series of small dams; this is also detrimental for cold-water species such as this taxon. The area has been declared water-quality limited by EPA and the State of Idaho. Fine sediment influx, generally from the same causes, is also a major problem. Springs in this area have been impacted by ground water pollution from agricultural and dairy operations; diverted into irrigation systems; capped and diverted for stock, domestic, industrial, and piscicultural water supply; heavily grazed; and dried due to groundwater drawdown.

Similar statements apply to the Bear River and other river drainages mentioned. Conditions in the various tributary rivers and springs are noted in the discussions of other taxa (notably the numerous Snake River *Pyrgulopsis* and "*Lyogyrus*" species with individual entries above). *Colligyrus* and "*Lyogyrus*" sites are threatened by being in and impacted negatively by public campgrounds, *e.g.*, the type locality for this species, with human usage and grazing causing some impacts are common. Grazing has negatively impacted nearly all springs in the region of occurrence, with many formerly mapped and named now dry. Many mapped springs are now grazed to the point that none of the native mollusk fauna remains. Many springs have been diverted or capped for stock, domestic, or industrial water supply. As we are currently surveying southeastern Idaho for springsnails (1991-1994), along with R. Hershler *et al.* (1993-1994), significant range extension or discovery of sizable numbers of new sites for individual taxa are not to be expected from future work.

Criteria for inclusion: Local endemics; loss of historic sites; specialized habitat; modification and loss of that habitat; occurrence on public lands. Many of the species occur in part or wholly on National Forest (*e.g.*, Targhee, Sawtooth; Challis; Cache; Bridger-Teton). or BLM or State (Idaho, Wyoming) lands. Mountain ranges involved include the Teton Range, Salt River Range, Gros Ventre Range, Big Hole Mountains, Caribou Range, Blackfoot Range, Bear River Range, Portneuf Range, Bannock Range.

Recommended status: None at present; recent discoveries need to be explored further. As noted above, some or all of the species involved may warrant Federal or State (Idaho, Montana, Wyoming) listing; and "*Lyogyrus*" in general should be regarded as a Sensitive genus by Forest Service, BLM, state, and other land management and wildlife agencies.

References: Pilsbry (1935); Taylor (1966a, b); Hershler (1999); Deixis collections, 1988-1999.

Fluminicola coloradensis Morrison, 1940
Colorado River pebblesnail

Type locality: Colorado River (unrestricted), Wyoming. Holotype USNM 526631.

Description: This is a large *Fluminicola*, with subglobose to broadly conical shell, height about 6.5-10 mm; whorls 3 1/2-4 1/2; teleoconch whorls convex, shouldered; frequently with broadly rounded sutural shelf; periostracum tan; shell opaque; gray-white; shell generally anomphalous; tentacles and snout generally deeply brown to black except for light eye patches; head light gray; visceral coil black; penis sickle-shaped, medium-sized, with narrow, distinct folds along basal 2/3; unpigmented except for black subepithelial granules along length of penial duct.

For much more complete description and illustrations, see Hershler & Frest (1996) and Hershler (1999).

Discussion: As restricted by Hershler and Frest (1996), this species comprised populations from the upper Green River (a Colorado River tributary) drainage in Wyoming. Hershler (1999) adds a number of southeastern Idaho (Snake and Bear River drainages) and eastern Utah (Bonneville Basin) populations to the species, even though some of these differ consistently in morphology, *e.g.*, southeastern Idaho spring specimens.

We would prefer to restrict the name to the Green River populations, but accept Hershler's (1999) revision, pending detailed DNA work. Southeastern Idaho populations occur mostly in springs and differ in shape, shell color, and detailed body morphology. Green River populations are mostly in headwater streams. Bonneville Basin populations occur mostly in small-medium rivers. These more definitely amniphile snails also differ in shell color and morphology from Green River populations.

Ecology: Found generally in spring-fed creeks; generally, substrate is gravel, cobbles, or boulders; macrophytes are limited to absent; water is very cold and clear. This species is a lithophile and aufwuchs grazer, found mostly in unpolluted headwater streams.

Original distribution: See above: Green River and tributaries, southwestern Wyoming: see Hershler and Frest (1996) for details. In Idaho, once widespread over SE ID in two forms, one characteristic of bear river and upper Snake River springs; the other found largely in large Snake River tributaries in SE Idaho. Note that we also recognize a river form in NE Utah that may be different from either of these as well as from the Green River tributary populations.

Current distribution: Survives in a few relatively unpolluted sites in the upper Green River drainage, southwestern Wyoming: see Hershler and Frest (1996)and Hershler (1999) for recent collections. As construed by Hershler (1999), found also in the following areas in the upper Bonneville Basin and southeastern Idaho: **IDAHO**: Bear Lake , Caribou, Oneida counties; **UTAH**: Elder, Cache, Morgan, Rich, Salt Lake, Tooele, Wasatch, Weber counties. Note that none of these forms has an extensive distribution or is found in large numbers of sites. Very likely, a species complex is involved, all of whose members may be Sensitive. Collectively,

Idaho distribution and comments: See above. Idaho specimens in my opinion represent two species, one of which occurs only in southeastern Idaho and the other mostly in southeastern Idaho, with a few sites in northeastern Utah; both are undescribed. Hershler (1999) quite adequately describes these two groups while still keeping them in *F. coloradensis*. For localities he accepts, see Hershler (1999). Hershler and I are searching for funding to revise the Idaho , Wyoming, and Utah *Fluminicola*, so that assignment to species is premature. Note that, in my interpretation, *F. coloradensis s.s.* may not occur in Idaho or Utah.

Specific Idaho sites: See Hershler (1999).

Threats: Eutropification from irrigation runoff and diversion; agricultural runoff; groundwater drawdown; diversion and usage of streams and tributary springs for livestock and also for human domestic usage; impoundment of free-flowing streams; hatchery development and wastes.

Criteria for inclusion: Limited habitat and threats to that habitat; possible occurrence on public lands; loss of historic sites. Some historic sites cannot be recollected due to polluted conditions and extirpation of the species.

Recommended status: No listing status at present. Some taxonomic problems remain to be resolved, with some workers dubious about the broad definition employed in Hershler (1999); and there is a possibility that populations from additional areas will be ascribed to this taxon. However, this species should be regarded as Sensitive by appropriate State (Wyoming, Utah, Idaho) and federal (BLM, Forest Service, National Park Service) land and wildlife management agencies even if broadly construed. Sites occur in Cache and Caribou National Forests; and on BLM lands in southeastern Idaho, northeastern Utah, and southwestern Wyoming.

References: Chamberlin and Jones (1929); Hershler and Frest (1996); Hershler (1999).

Fluminicola n. sp. A
vagrant pebblesnail [in part]

Type locality: None designated as yet; several species involved. We are currently working on these taxa with R. Hershler (NMNH).

Description: Under this rubric are included several species related to *Fluminicola fuscus* and *Fluminicola coloradensis*. Many of these snails have been recorded in the literature as *Fluminicola hindsi, sensu* Taylor (1966b; 1977 unpub.; 1985a: see map therein). With the recent revision of the nominate *Fluminicola* species by Hershler & Frest (1996), *hindsi* is a synonym of *fuscus*, and *coloradensis* is a valid full species. The species here considered are as yet insufficiently characterized in regard to morphology and distribution as to permit separate entries. We are working on these currently with R. Hershler (NMNH), however, and such information is likely to be available within the next few years. It is quite likely that some will be very limited in distribution and in some danger of extinction, so that protection will be warranted. Hershler (1999) places some of these populations in *F. coloradensis* (see entry above).

Ecology: Most of these taxa are cold-water stenotherms and crenocole, limnocrene, or spring-influenced (crenophile) stream species. Generally, these prefer cold, clear, water with near-saturation amounts of dissolved oxygen, no or minor nutrient enhancement (oligotrophic waters); and coarse but stable substrate. Almost all are lithophiles and perilithon feeders. Common mollusk associates are other hydrobiids, such as *Pyrgulopsis* and "*Lyogyrus*" species, and other cold-water taxa, such as *Vorticifex effusa effusa*. Preferred habitats generally have abundant *Rorippa*, and common *Veronica* and *Chara*; but relatively minor amounts or coverage by epiphytic algae and such tolerant macrophytes as *Ceratophyllum* and *Potamogeton crispus* and *filiformis*.

Original distribution: Taxa reported as *hindsi* from the following areas will have to be reassigned; Salmon River upstream from River of No Return, *i.e.*, eastern Idaho; middle and Upper Snake River, Blackfoot River, Teton River, and Salt River, southern Idaho and Wyoming; springs tributary to the middle and upper Snake and the large tributaries just listed; Bear River drainage (including springs), southeastern Idaho and northeastern Utah; John Day River, Oregon.

Current distribution: See above; most survive at scattered sites within the range specified above; and all have lost most of their original distribution and many historic sites represented in museum collections and the literature.

Idaho distribution and comments: See last entry. At present, most or all middle Snake, upper Snake, and some Salmon River forms belong here; southeastern Idaho sites belong to coloradensis (see last entry) or to other

species also best grouped here. Hershler and I intend to revise the Idaho, Wyoming, and Utah Fluminicola. Some sites involved are given below.

Specific Idaho sites: 425, 933, 994-996, 1290, 1293, 1640, 1684, 1687, 1688, 1691, 1693, 2021-2023, 2070, 2073, 2087, 2104, 2105, 2120.

Threats: Specifics of former sites can be given in many cases, based on Taylor's (1966a) map, museum collections, and on field notes. This will be deferred until species are better characterized.

Much of the middle Snake River in Idaho is rapidly becoming eutropified, due to agricultural runoff, trout farms, and urbanization along the river corridor. Much of the river is impounded behind a series of small dams; this is also detrimental for cold-water species such as this taxon. The area has been declared water-quality limited by EPA and the State of Idaho. Fine sediment influx, generally from the same causes, is also a major problem. A recent (1994) landslide impacted some of the historic sites. Introduction of exotic mollusk species (Bowler, 1991) may also be a factor in the species' decline. Springs in this area have been impacted by ground water pollution from agricultural and dairy operations; diverted into irrigation systems; capped and diverted for stock, domestic, industrial, and piscicultural water supply; heavily grazed; and dried due to groundwater drawdown.

Similar statements apply to the Salmon and other river drainages mentioned. Conditions in the various tributary rivers and springs are noted in the discussions of other taxa (notably the numerous Snake River *Pyrgulopsis* and *"Lyogyrus"* species with individual entries above). *Fluminicola* sites are threatened by being in and impacted negatively by public campgrounds, with human usage and grazing causing some impacts are common. Grazing has negatively impacted nearly all springs in the region of occurrence, with many formerly mapped and named now dry. Many mapped springs are now grazed to the point that none of the native mollusk fauna remains. Many springs have been diverted or capped for stock, domestic, or industrial water supply. As we are currently surveying southeastern Idaho for springsnails (1991-1994), along with R. Hershler *et al.* (1993-1994), significant range extension or discovery of sizable numbers of new sites for individual taxa are not to be expected from future work. Survey of the Great Basin for such sites has essentially been completed (Hershler, 1998, 1999).

Criteria for inclusion: Local endemics; loss of historic sites; specialized habitat; modification and loss of that habitat; occurrence on public lands. Many of the species occur in part or wholly on National Forest (*e.g.,* Targhee, Sawtooth; Challis; Cache) or BLM or State (Idaho) lands.

Recommended status: None at present; recent discoveries needing to be explored further. As noted above, most or all are likely to warrant Federal or State (Utah, Oregon, Idaho) listing; and *Fluminicola* in general should be regarded as a Sensitive species by Forest Service, BLM, state, and other land management and wildlife agencies.

References: Taylor (1966b; 1977, unpub.; 1985a); Hershler & Frest (1996); Deixis collections, 1988-1994.

Fluminicola n. sp. B
[other large *Fluminicola* species; no common names]

Type locality: None designated as yet; several species involved. We are currently working on these taxa with R. Hershler (NMNH).

Description: Here discussed are several undescribed species related to *Fluminicola virens.* Many of these snails have been recorded in the literature as *Fluminicola nuttalliana* or *virens, sensu* Taylor (1966a; 1977, unpub.; 1985a); Clarke (1981); Burch (1989); and many other authors. With the recent revision of the nominate *Fluminicola* species by Hershler & Frest (1996), *nuttalliana* is a species likely originally restricted to part of the lower Willamette River [and possibly the lower Columbia below Portland], and probably now extinct. *Fluminicola virens* may occur only in parts of the Willamette system and the lower Columbia River.

The undescribed, *virens*-like species are as yet insufficiently characterized in regard to morphology and distribution as to permit separate entries. We are working on these currently with R. Hershler (NMNH), however,

and such information is likely to be available within the next few years. It is quite likely that all or many will be very limited in distribution and in some danger of extinction, so that protection will be warranted.

Ecology: Most of these taxa are cold-water stenotherms and spring-influenced amniphile species. Generally, these prefer cold, clear, streams with near-saturation amounts of dissolved oxygen, no or minor nutrient enhancement (oligotrophic waters); continual current; and coarse but stable substrate. Almost all are lithophiles and perilithon feeders. Common mollusk associates are other cold-water taxa, such as *Vorticifex effusa effusa,* and species such as *Physella gyrina, Margaritifera falcata*, and *Gonidea angulata*. Preferred habitats generally have few rooted aquatic macrophytes and relatively minor amounts or coverage by epiphytic algae and such tolerant macrophytes as *Ceratophyllum* and *Potamogeton crispus* and *filiformis*; such may occur in finer-substrate areas nearby.

Original distribution: Taxa reported as *nuttalliana* or *virens* from the following areas will have to be reassigned: Okanogan, Methow, and possibly Wenatchee rivers, Washington; Deschutes River, Oregon; portions of the Columbia River, from the Hanford Reach to The Dalles, and possibly to the mouth, Washington and Oregon; and from the Clearwater River, Idaho. Also relevant here are the larger coastal species of *Fluminicola* north of the Oregon Umpqua drainage up to and including the Chehalis River; and some western Cascades forms from the Willamette Valley (Oregon) north to the Nisqually River drainage, Washington.

Idaho distribution and comments: Possibly involves such Idaho streams as the Clearwater River.

Specific Idaho sites: None specified as yet.

Current distribution: See above; most survive at scattered sites within the range specified above; and all have lost most of their original distribution and many historic sites represented in museum collections and the literature. For sites for many of these forms in the Columbia Basin, see Neitzel & Frest (1993); these were recorded as *Fluminicola* species other than *columbiana* [=*fuscus*; *q.v.*] and *hindsi* [see above].

Threats: Specifics of former sites can be given in many cases, based on Taylor's (1966a) map, museum collections, and on field notes. This will be deferred until the individual species are better characterized. Problems in the Columbia River proper and many of its larger tributaries include impoundments; continued siltation and other impacts on the few remaining sites with habitat characteristics approximating pre-impoundment conditions. Harbor and channel "improvements" in the vicinity of Portland, The Dalles, and John Day Dam; nutrient enrichment due to agricultural run off. For more details on threats for some specific rivers with these species, see Frest & Johannes (in press), especially on the Okanogan, Methow, and lower Clearwater; see also Hershler & Frest (1996).

Similar statements apply to the Deschutes River and other river drainages mentioned. Conditions in the various tributary rivers and springs are noted in the discussions of other taxa (notably *Juga* (*Oreobasis*) *bulbosa*; *Juga* (*Juga*) *hemphilli maupinensis*; *Fluminicola fuscus*; *Physella columbiana*, *Fisherola nuttalli*; and *Anodonta californiensis*, all of which see). In general, the coastal streams of Washington and Oregon presently are often rather degraded, due to a combination of logging and concomitant siltation, etc., grazing and other agricultural activities, and urbanization. Agricultural effects are paramount in the Willamette Valley until the Portland area is reached (allowing for more minor urban centers, such as Corvallis, Salem, Albany, and Eugene). In the Washington western Cascades, logging, grazing, and agricultural effects are of about equal concern. Urbanization is the most serious, and growing, concern in the Vancouver, Olympia, and the Tacoma to Seattle corridor.

Criteria for inclusion: Local endemics; loss of historic sites; specialized habitat; modification and loss of that habitat; occurrence on public lands. Many of the species occur in part or wholly on National Forest (*e.g.*, Clearwater, Wenatchee; Okanogan; Cache; Gifford Pinchot; Olympic; Willamette; Siuslaw), BLM, or State (Washington, Oregon, Idaho) lands, *e.g.*, Capitol Hills State Forest (Washington); Tillamook State Forest (Oregon).

Recommended status: None at present; recent discoveries need to be examined further. As noted above, some are likely to warrant Federal or State (Washington, Oregon, Idaho) listing; and *Fluminicola* taxa in general should be regarded as a Sensitive species by Forest Service, BLM, state, and other land management and wildlife agencies.

References: Taylor (1966a; 1977, unpub.; 1985a); Neitzel & Frest (1993); Hershler & Frest, 1996; Deixis collections, 1988-1998.

Pristinicola hemphilli (Pilsbry, 1907)
pristine springsnail

Type locality: Uncertain, and probably extirpated in any case; Kentucky Ferry [*sic*], Snake River, Washington; for information on the likely location of this Hemphill site, see Henderson (1936) and Hershler *et al.* (1994). Lectotype ANSP 31176; paralectotypes ANSP 368405.

Description: See Hershler *et al.* (1994) for detailed anatomy and shell description and illustrations. The small, elongate, *Bythinella*-like conch is unique in western North America. Shell white, partly translucent, elongate pupiform: height generally 2-3 mm; whorls 5 1/2; flattened, gently convex; sutures deeply impressed. Aperture reinforced slightly all around, orthocline; last 1/4 whorl often slightly disjunct and reflected. Body almost pigmentless except for small eye spots.

Discussion: As presently construed, the taxon embraces a wide range of shell morphology. With further study, *Pristinicola* may prove to be a species group, rather than a monospecific genus. This divergent lithoglyphinid does not appear to be closely related to typical western North American taxa, such as *Fluminicola* (*s.l.*).

Ecology: Occurs mostly in very small springs and seeps; sometimes in larger springs, spring runs, or strongly spring-influenced small streams. A crenophile taxon, generally a perilithon grazer and lithophile. Substrate is usually coarse; *Rorippa*, *Mimulus*, and bryophytes are the commonly associated plants. Most sites are in semiarid areas, in low-medium elevation sage scrub; but Cascades sites are in fairly dense Douglas fir forests at low-medium elevations. Often this is the only common mollusk; the most frequent associates are *Pisidium insigne* and *Fossaria* spp. At some sites, this taxon occurs with *"Lyogyrus"* spp., *Juga* spp., or *Fluminicola* spp. Sites are generally very shallow; very cold, clear; have slow-moderate flow; and are relatively undisturbed.

Original distribution: Scattered sites in -part of the Columbia Basin, including a few large tributaries; and south in the Willamette and the coastal drainages at least to southwestern Oregon and Del Norte County, California. Absent from northern Washington; interior Oregon except for the Blue Mountains and Deschutes River drainage; and from all except western Idaho (not in the Snake system above the Weiser area).

Current distribution: See Hershler *et al.* (1994) for detailed site descriptions. Surviving sites are often on public lands, including BLM (Baker District); Hells Canyon National Scenic Area; the Grand Coulee area (Bureau of Reclamation); Gifford Pinchot National Forest; state and federal fish hatcheries in the Columbia Gorge, etc. In southwestern Oregon and northwestern California, this species is now known to occur in the Rogue, Umpqua, and Smith river drainages.

Idaho distribution and comments: As of 1999, there remain no Montana sites; and penetration of this taxon into Idaho remains relatively minor, with no sites in the Rocky Mountain Province regions of the state; and very limited occurrence in the Panhandle counties. Thus, this species complex (for so it likely is) occurs mostly here along the lower Salmon River; in Hells Canyon; and in the Spokane area.

Specific Idaho sites: 1341, 1342

Threats: The small semiarid grassland to mesic forest springs and seeps preferred by this species are very readily subject to modification and destruction from a variety of causes. Recently extinct sites of which we are aware were extirpated by road building and maintenance (Washington 14; I-84), grazing (Baker District BLM), dam construction and maintenance (Hells Canyon Dam, John Day Dam); and diversion and capping for campground,

hatchery, stock, and domestic water supply (Columbia Gorge area). In the Columbia Basin part of the range, grazing is probably the biggest single problem. On the Westside (west Cascades and Coast ranges), logging and urbanization are the primary concerns. In some areas, nutrient-enriched groundwater is a problem also, *e.g.,* Grant County, Washington. In both areas, diversion, modification, or outright destruction of small springs is rampant.

Criteria for inclusion: Local endemic; occurrence on public lands; loss of historic sites and habitat loss and threats to the remaining localities.

Recommended status: None at present; there are about 70 sites presently known, some of which could be secure. The species should be regarded as Sensitive by the BLM, Forest Service, and other appropriate land management and wildlife agencies. With further study, there is some possibility that this taxon will be divided into several species, each of which would then possibly require protection. At present, this taxon should not be listed in Washington or Oregon; but as there are few sites in Idaho and California, state listing as Threatened may be appropriate.

References: Henderson (1929a, 1936b); Hershler *et al.* (1994); Deixis collections, 1987-1999.

Promenetus exacuous megas (Dall, 1905)
prairie sprite

Type locality: Birtle, Manitoba; syntypes USNM 63391.

Description: See Dall (1905) and Clarke (1973, 1981) for description and illustrations: see also Baker (1945). Much like the nominate form (small, lenticular; with peripheral keel); but much larger and with conspicuous periostracal fringe. Diameter to 8 mm; whorls 4; shell strongly depressed, planorboid, lenticular; very angular periphery at whorl midpoint, with strong peripheral keel bearing distinct periostracal fringe of small, hairlike processes up to 1 mm in length. Shell with strong spiral striation on both sides, including several raised striae with fine periostracal fringes; umbilicus shallow, wide, about 1/4 shell diameter.

Discussion: This rather conspicuous form was overlooked, not surprisingly, by Burch (1989). Much of the known distribution is in Canada (Clarke, 1981); but some core US and Alaskan sites have long been known. Originally described as *Planorbis* (*Menetus*) *exacuous* var. *megas* Dall, 1905.

Ecology: Especially common in slightly eutrophic to oligotrophic lakes and kettle lakes; to north in Canada, in smaller bodies of water. Sites are often cold; have macrophyte beds (including *Ceratophyllum, Elodea, Potamogeton* spp.) and have some epiphytic algae. This species does not prefer vernal water bodies and is most abundant in larger perennial lakes. Substrate is often mixed, but with mud and silt a major part. Associated mollusks include a variety of freshwater taxa in the genera *Gyraulus, Planorbella, Valvata, Lymnaea, Stagnicola, Fossaria,* and sphaeriids: more rarely but characteristically *Amnicola, "Lyogyrus",* and *Bithynia* may occur at the same sites. See Clarke (1973) for details of Canadian occurrences. This taxon seems much less tolerant in its habitat requirements than the nominate subspecies.

Original distribution: For range in Canada (portions of the prairie provinces), see Clarke (1973, 1981). Range in the US is poorly known. Originally, portions of northern Washington, northern Idaho, and western Montana and Wyoming(?).

Current distribution: Rare in undisturbed or relatively undisturbed kettle lakes within the original range. There are several sites in Washington and Montana.

Idaho distribution and comments: Likely to occur in the Idaho Panhandle counties along a narrow corridor; but so far no specific Idaho sites.

Specific Idaho sites: See above. Note that the likelihood of many sites is very small.

Threats: This species is not found in strongly eutropified kettle lakes, nor in streams. Lakes used as part of irrigation systems, with untreated sewage, or having other sources of nutrient enrichment, seem to lack the species. Lakes with extensive treatment to kill out aquatic macrophytes or to stock or modify the native fish fauna also seem to lack this species. The great majority of northern Washington, Idaho, and northwestern Montana lakes have such problems. The species is definitely declining in terms of populations and number of individuals. We have noted a number of Washington kettle lakes in which dead specimens may still be dredged from bottom sediments but live specimens no longer occur.

Criteria for inclusion: Local endemic; occurrence on public lands; ongoing major threats; very substantial reduction in habitat. Habitat and range for this taxon are unlikely to be substantially expanded by future work.

Recommended status: This species has no special status at present. It should be considered a Sensitive species by the Forest Service, BLM, and other land management and wildlife agencies. When the range is better understood, it is possible that Federal and State (Washington, Idaho, Montana) listing will be appropriate; but this species may still be fairly common and in no immediate danger of extinction.

References: Dall (1905); Clarke (1973, 1981); Deixis collections, 1991-1993.

Stagnicola (*Hinkleyia*) *montanensis* (Baker, 1913)
mountain marshsnail

Type locality: Hayes Creek, Bitterroot Mountains, near Ward, Montana; types in UMMZ (76196); see Taylor, Walter, & Burch (1963) for discussion of both types and type locality.

Description: The best description is Taylor, Walter, & Burch (1963); see this and Burch (1989, fig. 630) for illustrations. See also Baker (1913). Adult moderately high conic, *ca.* 6-7 mm height at 6-6 1/2 whorls; very thin, reddish shell with convex, rather flattened whorls; periphery well below median point; transverse striae low, moderately strong. Aperture thin; columellar plait present but subdued; aperture height about 50% of total spire height.

Discussion: This is a rather small taxon with fairly numerous, close whorls. The ecology is unusual for the genus.

Ecology: Found mostly in small, perennial, very cold streams and spring outflows; unlike many *Stagnicola*, never found in seasonal ponds, stagnant or muddy water bodies, or (unlike many *Lymnaea*) in larger clear-water bodies, such as large perennial rivers and lakes. Substrate varies from mud to cobbles; aquatic macrophytes are generally rather uncommon or absent; *Rorippa* and bryophytes are most common. Most site with this species have flow, but minor volume and shallow depth. Elevation varies; but moderate to higher-elevation sites are either more common or more likely to have survived to the present.

Original distribution: Eastern Columbia Basin and western Great Plains; about 21 sites in Nevada, Idaho, Montana, Wyoming, and Utah, with most sites in southeastern Idaho and adjacent parts of Wyoming and Utah; see Taylor, Walter, & Burch (1963) for map and discussion.

Current distribution: Survives at some of the original sites; some of the Idaho and Utah sites are now extirpated. As we are currently surveying southeastern Idaho for springsnails (1991-1994), along with R. Hershler *et al.* (1993-1994), significant range extension or discovery of sizable numbers of new sites for individual taxa are not to be expected from future work in this area. Some portions of the range, *i.e.,* in Wyoming and Montana, need much additional survey work.

Idaho distribution and comments: Most historic Idaho sites were in southeastern Idaho, i.e., in Rocky Mountain Province areas of the state. This is a limited area, considering that the Snake River Plain region is mostly implausible for this taxon.

Specific Idaho sites: See Taylor, Walter, & Burch (1963) for specifics. Our research indicates that at least some of these sites are now extirpated. Only one confirmed extant: 1572.

Threats: The small drainages and spring outflows preferred by this species are particularly vulnerable to grazing. Small semiarid springs and seeps preferred by this species are very readily subject to modification and destruction from a variety of causes. Among these are road building and maintenance; dam construction and maintenance; location of housing and industrial buildings; and diversion and capping for campground, hatchery, stock, and domestic water supply. In the range as a whole, grazing is probably the biggest single problem. In some areas, nutrient-enriched groundwater is a problem also.

Criteria for inclusion: Local endemic; loss of historic sites and range; very specialized habitat.

Recommended status: No formal status at present, although the species should be regarded as Sensitive by the BLM, Forest Service, and other appropriate land management and wildlife agencies. Further exploration in its limited habitat may show that this species is in need of Federal ESA or equivalent State (Idaho, Montana, Wyoming, Nevada, Utah) protection.

References: Taylor, Walter, & Burch (1963); Burch (1989); Deixis collections, 1988-1994.

Valvata tricarinata (Say, 1817)
threeridge valvata

Type locality: Delaware River; holotype ANSP 58151a.

Description: See Burch (1989, fig. 33) for best short description and illustration. This is a small taxon , generally under 6 mm in diameter; shell with three moderately strong carinae on body whorl (dorsal (supraperipheral: upper whorl), central (peripheral) and ventral (subperipheral; basal, lower whorl)); shell generally greenish yellow or green; shoulder of body whorl rounded evenly above; apertural lip adnate; aperture more or less terminally rounded. In *Valvata winnebagoensis*, the only closely similar species, all three carinae are stronger; the body whorl shoulder is nearly planar; and the aperture is complete and more or less polygonal .

Ecology: Occurs in a variety of permanent lacustrine or perennial lake-like habitats, including portions of larger rivers. Generally found in cool-cold clear waters, on soft substrate, in areas with macrophytes (*Chara*, *Myriophyllum*, *Ceratophyllum*, etc.). Very abundant on marl substrates in kettle lakes, often to a considerable depth.

Original distribution: "Quebec and New Brunswick west to Alberta and south to Wyoming, Arkansas, and Virginia" (Burch, 1989). As emphasized by Taylor & Bright (1987), western US occurrences are strongly disjunct, as this species does not now occur in the Missouri headwaters. Specimens from the Washington and Montana populations need to be compared in detail with more easterly occurrences, in view of the fact that speciation has occurred in several other genera with disjunct species swarms with both eastern and western representation, *e.g.*, *Pyrgulopsis*, *Tryonia*, *Amnicola*, and *"Lyogyrus"*. For *Pyrgulopsis*, see Hershler (1994, 1998); for *Amnicola* and *"Lyogyrus"*, see discussion herein and Hershler (1999).

Current distribution: In the western US, this species is quite rare, similar environments being occupied by *Valvata humeralis*. Through the efforts of R. B. Brunson, this basically Mississippi drainage and Atlantic species is now known from several lakes in the Clark Fork and Flathead drainages. T. Burke (pers. comm., 1994) has found this species in Lake Roosevelt, Washington as well. Taylor & Bright (1987) show this taxon from 3 Ferry County, Washington sites. Some known sites are on the Flathead Indian Reservation (Montana), Bureau of Reclamation

reservoirs, and other public owned or regulated lands. The species is certainly very rare in Washington; and recent (1994) searches in Idaho turned up no sites, althoug hthe sepcies could well occur.

Idaho distribution and comments: As with several other basically eastern US taxa, this relatively widespread form is rare in the western US. Occurrence in Idaho is likely, considering that a few (very rare) sites persist in northeastern Washington and in northwestern Montana. Sites would be in the northeastern part of the Washingtonian Province area, that is, the northern Panhandle counties in Idaho.

Specific Idaho sites: Despite old literature reports, there are no confirmed museum lots or known surviving sites. Persistence of a few is likely, however.

Threats: Modification, poisoning, and eutropification of kettle lakes. In particular, nutrient enhancement due to farm animal wastes, sewage, or to irrigation runoff may so eutropify lakes as to exclude this species. Most kettle lakes in its western US range have been so affected, or have been made part of irrigation systems.

Criteria for inclusion: Rare in this region; occurrence on public lands; substantial range loss; occurrence in specialized habitat.

Recommended status: No formal status is recommended at present. More work is necessary to determine the species' current status in Washington, Idaho and Montana. It should minimally be regarded as a Sensitive species by the Forest Service, BLM, and other appropriate land management and wildlife agencies. Listing in the western US is likely to prove necessary, even though the species' status in the eastern US is much better. Note that there is some possibility that western populations are morphologically distinct.

References: Taylor & Bright (1987); Burch (1989); Deixis collections, 1994, 1996.

Freshwater bivalves

Gonidea angulata (Lea, 1838)
western ridgemussel

Type locality: "Lewis's River" [Snake River], Idaho; holotype USNM 86759. Johnson (1973) interpreted Lea's type locality as being the Lewis River, a Columbia tributary in Cowlitz, Clark, and Skamania counties, Washington. Taylor (1981) more reasonably interpreted it as the Snake River, under one of its' oldest names. There are sporadic occurrences of *G. angulata* in southwestern Washington; but not in the Lewis, so far as we are aware.

Description: See Burch (1973, 1975b) for best short description and illustration (1973, figure 11). This taxon is very distinctive. *Gonidea angulata* lacks hinge teeth; has a sharp posterior ridge; the posterior length exceeds the anterior; but the shell is not winged; shell periostracum generally greenish, sometimes lightly rayed with yellow; shell generally thin; nacre coppery blue-white; length 7-more than 9 cm.

Ecology: Found mostly in creeks and rivers of all sizes; rarely in lakes or reservoirs unless with substantial flow. This amniphile, filter-feeding taxon can live on firm mud substrate as well as on more coarse materials (which are more typical). More pollution-tolerant than some unionids; but still absent from highly polluted areas and places with unstable or very soft substrate. The host fish for the glochidia of this species is (are?) unknown.

Original distribution: "Southern British Columbia to southern California, eastward to southern Idaho and northern Nevada" (Taylor, 1981). It should be noted that the species had a limited distribution west of the Cascades, particularly in Washington and Oregon, where most sites north of southwestern Oregon are doubtful. There are valid sites from southwestern Washington, where the species appears quite sporadic.

Current distribution: Uncertain. Known to be extirpated from many of the old sites, including much of the Snake system; but still common in some areas. Still occurs sporadically in some major tributaries to the Columbia and Snake, such as the Okanogan River (Washington) and Clearwater River, Hells Canyon, and middle Snake River (Idaho). Formerly in Little Granite Reservoir (Frest & Johannes, 1992b); but this population is believed to have been extirpated by the 1993 drawdown.

Idaho distribution and comments: In Idaho, the best populations were and remain in the middle Snake River and in Hells Canyon, where not heavily impounded. Lower Salmon River populations are also large locally.

Specific Idaho sites: 427, 433, 434, 500, 1147, 1148.

Threats: Extensive diversion of California rivers for irrigation, hydroelectric, and water supply projects has much reduced the California range of this species. This species can tolerate some water pollution; but not heavy nutrient enhancement or similar problems. For some recent records, see Taylor (1981), Frest & Johannes (1991a, 1992b, 1993e, 1994, 1995c).

Much of the middle Snake River in Idaho is rapidly becoming eutropified, due to agricultural runoff, fish farms, and urbanization along the river corridor. Much of the river is impounded behind a series of small dams; this is also detrimental for cold-water species such as this taxon. The area has been declared water-quality limited by EPA and the State of Idaho. Fine sediment influx, generally from the same causes, is also a major problem. A recent (1994) landslide impacted some of the historic sites. For some recent Idaho sites for this species, see references under Frest & Johannes (in part).

In the lower Columbia River region threats include impoundments; continued siltation and other impacts on the few remaining sites with habitat characteristics approximating pre-impoundment conditions on the lower Columbia. Harbor and channel "improvements" in the vicinity of Portland, The Dalles, and John Day Dam; nutrient enrichment of the lower Columbia due to agricultural run-off.

This taxon is declining, in terms of area occupied and number of sites and individuals. Note that the fate of the fish larval host(s) also limits and determines the distribution of this species.

Criteria for inclusion: Regional endemic; loss of historic sites; human modification throughout range; concentration of human activities within preferred habitat; occurrence on public owned or regulated lands.

Recommended status: We do not recommend Federal or State (Washington, Oregon, Idaho) listing as this point, although the species minimally should be considered Sensitive by the BLM, Forest Service, and other appropriate land management and wildlife agencies. More survey work needs to be done on this species, particularly in Oregon.

References: Burch (1973, 1975b); Taylor (1981); Deixis collections, 1987-1994, 1996-1998.

Margaritifera falcata (Gould, 1850)
western pearlshell

Type locality: "Puget Sound, Oregon" [*sic*: now Washington]; holotype USNM 5893, according to Johnson (1964).

Description: For best short description and illustration see Burch (1973, 1975b). The generally purple nacre and hermaphroditic condition are distinctive as compared to *Margaritifera margaritifera*, the most closely related species. See also discussion in Taylor (1988b).

Ecology: Primarily an amniphile species; medium-sized streams are preferable, although sometimes found in streams considerably narrower than 1 m (*contra* Clarke, 1981); rarely, in lakes with stream-like conditions. Generally in fast, clear, very cold areas with coarse substrate. In undisturbed streams, this species may cover the bottom.

Host fish for the glochidia include chinook salmon, rainbow trout, brown trout, brook trout, speckled dace, Lahontan redside, and Tahoe sucker (Clarke, 1981).

Original distribution: "Southern Alaska to central California, eastward to western Montana, western Wyoming, and northern Utah" (Taylor, 1981).

Current distribution: Extinct in most of the Snake system (except for upper tributaries, including the Blackfoot River (Idaho) and some major creeks in Idaho and Wyoming); extinct from many of the coastal streams, in which it was once ubiquitous. Status of interior populations needs further work; extinct in the Okanogan River, *e.g.*, many populations do not appear to have reproduced for many years. Populations persist locally in parts of the Coeur d'Alene system, including the Coeur d'Alene River and St. Maries River.

Idaho distribution and comments: See above. Formerly widespread throughout the state. Populations still persist in the St. Joe and St. Marie system; the Little Salmon River; the Blackfoot River; and in the Pahsimeroi and Lost Rivers. Most Snake populations are extinct, except for those in unimpounded portions of Hells Canyon. Proposals to harvest freshwater mussels in Idaho should be rejected, as there are too few left to justify such actions. In particular, it is believed that reductions in anadromous fish populations will result in near extinction of this taxon in the state.

Specific Idaho sites: 1997-1999, 2087.

Threats: Extensive diversion of rivers for irrigation, hydroelectric, and water supply projects has much reduced the Washington, Oregon, Idaho, and California range of this species. This species is not as tolerant of water pollution as *Gonidea angulata* and *Anodonta kennerlyi*; heavy nutrient enhancement, siltation, unstable substrate, or similar problems extirpate populations. For some recent records, see Taylor (1981), and Frest & Johannes (1991a, 1992b, 1993e, 1994, 1995c).

Much of the middle Snake River in Idaho is rapidly becoming eutropified, due to agricultural runoff, fish farms, and urbanization along the river corridor. Much of the river is impounded behind a series of small dams; this is also detrimental for cold-water species such as this taxon. The area has been declared water-quality limited by EPA and the State of Idaho. Fine sediment influx, generally from the same causes, is also a major problem. A recent (1994) landslide impacted some of the historic sites. For some recent Idaho sites for this species, see references under Frest & Johannes (in part). Conditions in the Snake are typical for many of the rivers in this species' range. We have seen no live specimens from the mainstem Snake recently.

In the lower Columbia River region threats include impoundments; continued siltation and other impacts on the few remaining sites with habitat characteristics approximating pre-impoundment conditions on the lower Columbia. Harbor and channel "improvements" in the vicinity of The Dalles and John Day Dam; nutrient enrichment of the lower Columbia due to agricultural run-off. We have seen no live specimens from the mainstem Columbia recently.

This taxon is declining, in terms of area occupied and number of sites and individuals. Note that the fate of the fish larval host(s) also limits and determines the distribution of this species.

Criteria for inclusion: Regional endemic; loss of most historic sites; human modification of habitat throughout the range; occurrence on public lands.

Recommended status: We do not recommend formal Federal or State (Washington, Oregon, Idaho, Montana, Wyoming, Nevada, & Utah) listing at this point, although the species should be considered Sensitive by the BLM, Forest Service, National Park Service, and other land management, wildlife, and water regulatory agencies. Further work needs to be dome to document range changes. it should be noted, however, that populations showing repeated reproduction (at least several age classes) are now the exception rather than the rule.

References: Burch (1973, 1975b); Taylor (1981); Deixis collections, 1987-1994.

COMMON TAXA NOT IN NEED OF PROTECTION

There follows some brief discussions of taxa known to be present in the State of Idaho; but at present believed to be in relatively robust condition, *i.e.*, well-distributed at many sites and not presently in danger of extinction. Time considerations prevented writing such discussions for all; and a species' exclusion may have no special significance. I have also included some discussions of non-native taxa, as some of these may pose threats to natives. Here again, time constraints prevented full discussion. Some freshwater taxa with very full literatures, such as various tropical snails in the middle Snake drainage and certain pests such as the New Zealand mudsnail and the Asian clam are too well known to need further comment here; but they are covered in the **REFERENCES**.

I list and discuss here the large number of terrestrial and freshwater mollusk species currently known or likely to occur in Idaho but not currently considered Sensitive in the usage employed above. These are mostly species with relatively wide distribution elsewhere in the western North American molluscan provinces or even farther extralimitally. The discussions for these taxa are organized in a somewhat different fashion than those preceding. For the most part, good descriptions and illustrations are available elsewhere, so that type localities and descriptions are not given here. See the earlier general references in **SPECIES DISCUSSIONS** for further information. A **Discussion** section is provided, often followed by a short paragraph on **Ecology**, **General Distribution**, and **Idaho distribution.** At present, no status recommendations are thought necessary for these taxa; but some comments on general rarity and expected abundance regionally are made in the **Status** section for each.

LAND SNAILS

NATIVE TAXA

Ancotrema (*Ancotrema*) *hybridum* (Ancey, 1888)
Oregon lancetooth

Discussion: Formerly this taxon was regarded widely as a subspecies of *Ancotrema* (*Ancotrema*) *sportella sportella*; but its status was elucidated quite effectively by Roth (1991), who also designated a lectotype (SBMNH 35134) and clarified the type locality (Astoria, Clatsop County, Oregon). Roth's treatment is accepted in Turgeon et al. (1998). Note that Branson (1977, 1980) and Branson & Branson (1984) failed to recognize this species. We found it at 2 of our 38 1996 western Washington sample sites, which ranked it in the range of 30-34 of a total diversity of 46 taxa. The species appears more common in southwestern Oregon.

Ecology: The ecology of this taxon is similar to that of *Haplotrema* (*Ancomena*) *vancouverense* and *Ancotrema* (*Ancotrema*) *sportella sportella*, in that the taxon is generally found in forest or grassy areas, often with some moisture. The latter two taxa are frequently found on floodplains and even in relatively cut-over terrain. A. hybridum seems more likely to be found associated with mature forest and also seems a more notic taxon than the other two common haplotrematids. It does not seem to be found with the more xeric-tolerant members of the family, such as *H. keepi* or *A. voyanum*. Generally, it is present in smaller numbers than either *H. vancouverense* or *A. sportella*. It is most frequently seen in moderately to highly diverse sites with one or more other haplotrematids. This taxon has been observed preying on *Vespericola columbianus* and *Vespericola* sp. and other haplotrematids, as well as in pursuit of *Monadenia* sp.

General Distribution: This taxon has been reported from localities ranging from central Washington to coastal northwestern California (northern Humboldt County: Roth, 1989, pers comm., 1998; Pilsbry, 1946). It is rare in the northern Cascades; and we have not seen it yet from either British Columbia or Alaska.

Idaho Distribution: So far, not definitely confirmed (reported in old works); but finds in northern Washington suggest that it could occur here also, particularly in the northernmost Panhandle counties.

Status: Seems to be at present rather widely distributed in Washington and Oregon. While it, like all NW widely distributed native land taxa, has lost most of its historic range, there are still numerous small colonies scattered over the range. No special status necessary unless found in Idaho, where it may well have a very limited range.

Ancotrema (*Ancomena*) *sportella sportella* (Gould, 1846)
beaded lancetooth

Discussion: This is the widespread form recognized commonly in the Oregonian, Klamath, and parts of the Washingtonian provinces. Note that Roth (1989) recognizes another subspecies, *sinkyonum*, in northwestern California. So far, we have been unable to establish the presence of that subspecies in southwestern Oregon. For phylogenetic analysis, see Roth (1991). Branson (1977, 1980) and Branson & Branson (1984) list this taxon from a variety of sites in the Washington Olympics, Oregon and Washington Cascades, and Oregon Coast Range. This subspecies was present at 22 of one set of 38 western Washington sites sampled in 1996, giving it a ranking of 9 or 10 of the 46 taxa present in total.

Ecology: Found in a variety of moist situations, ranging from grassy headlands to mature forest. One of the more hardy native species, found quite often even in relatively cut-over forests, though generally not present or just sporadic in recent clearcuts. Also one of the taxa most likely to be found along floodplains, including at least occasionally flooded situations. An omnivore, eating a wide variety of plant material, and also carnivorous on other land snails. Seen locally preying on *Vespericola* spp., *Trilobopsis* spp., and *Monadenia* spp., as well as apparently on other haplotrematids.

General Distribution: Southern Alaska (Aleutian Islands) to northwestern California (Humboldt County): Roth (1989). Note that most northwestern California occurrences (Humboldt and Mendocino counties) are best ascribed to *A. sportella sinkyonum*, but that at least some extreme northwestern California (coastal Del Norte County, northern coastal Humboldt County) occurrences, especially close to the Coast, are apparently the nominate subspecies. Note that interior populations in Humboldt and Mendocino counties are ascribed to *sinkyonum* by Roth (1989).

Idaho Distribution: Reported from older works; but no definite museum lots or recent confirmed specimens. Could well occur in northern Idaho, from about the Clearwater drainage north.

Status: No special status required; common and widespread over much of its range. Like many if not all of the historically widespread native land taxa, this species has undoubtedly lost the majority of its historic range due to

human modification, especially lumbering. A crude guess would be extirpation from 90% of the total original range. But remaining colonies are numerous and widely distributed through much of the former range, so that extinction is not at all likely in the near future. This is perhaps the most commonly found larger land snail in southwestern Oregon. Finds in Idaho may well be quite limited in numbers and in area; and could require protection. Very likely occurs with *Haplotrema* (*H.*) *vancouverense* at one or more Idaho sites.

Allogona (*Dysmedoma*) *ptychophora ptychophora* (Brown, 1870)
dry land forestsnail

Discussion: This taxon is still widely distributed in eastern WA, northern ID, eastern OR, and western MT. It is also the most commonly encountered larger land taxon in the Lower Salmon River Valley, with over 79 sites (Frest & Johannes, 1995, Table 3; Appendix C4) scattered through the survey area. While a number of dead-only sites were noted (Table 4) and considerable site loss has occurred, here as elsewhere, this taxon is in no present danger of local extinction. Although this subspecies does prefer somewhat xeric habitats, the most xeric are inhabited by the subspecies *solida* (*q.v.*) and the species is common in dry-moderately wet forested sites as well. No substrate preference is obvious; and talus piles are especially good habitat, particularly if springs or seeps are nearby. A wide variety of plant taxa were noted at sites with this species; and it occurs through a broad elevation range.

Considerable variation was noted in Lower Salmon populations in terms in shell morphology, body color, and anatomy; and it is quite possible that the nominate subspecies is actually a species complex; this point requires further investigation. Montana populations (which include the type locality) are seemingly not as variable.

Other populations are noted in Hells Canyon and elsewhere in extreme western Idaho, often at drier sites, and to a certain point to he north, though not to the Canadian border. This species seems in no danger of extinction currently. It is absent from southern Idaho.

Anguispira kochi occidentalis (Von Martens, 1882)
western globe

Discussion: This taxon is widely distributed in the Rocky Mountain and Washingtonian provinces, with isolated Oregonian occurrences as well. Most typically, it is a mesic land snail particularly characteristic of moderate-high elevation coniferous and mixed coniferous-deciduous forests. No substrate preference is evident. The more xeric occurrences, *e.g.* in the Columbia Gorge, OR-WA have been termed *Anguispira kochi eyerdami*, a taxon which could be valid, based on present knowledge. Local sites are similar in ecology and few in number (5 only: see Table 4 and Appendix C6). Common associates generally are other mesic forest snails, such as *Cryptomastix mullani mullani* and *mullani olneyae*; *Allogona lombardii*; and such species as *Oreohelix subrudis* and *Hemphillia camelus*. In the Lower Salmon River area, occurrences are similar in associates and ecology; but may include local endemics such as *Cryptomastix mullani latilabris*, *Oreohelix haydeni hesperia*, or *Oreohelix* n. sp. 22.

As might be expected, forest habitat with this species is currently quite limited in the Lower Salmon River area; and occurrences are at higher elevations or in relict, mature forest areas. This taxon is in no danger of extinction generally; but is rare locally, and could be extirpated in this region if care is not taken with existing sites. Most surviving sites are likely at moderate elevations on Forest Service lands.

Other populations are noted in the Clearwater drainage and over northern Idaho, often at higher elevations. This species seems in no danger of extinction currently. It is absent from southern Idaho.

Carychium occidentale Pilsbry, 1891
western thorn

Discussion: This small (about 1.5-2.3 mm length at 5-5 1/2 whorls), tall, strongly conic, white snail is not readily confused with any other native southwestern Oregon terrestrial taxon. It bears some resemblance to the freshwater *Pristinicola hemphilli* (q.v.), which sometimes occurs nearby. The parietal lamella is a readily seen distinctive feature of *Carychium*.

Ecology: Like other members of the genus, *occidentale* prefers strongly notic habitats, such as very moist (and perennially so) forest lowlands, edges of floodplains, bases of slopes, and especially stream, spring, or water body edges, plus such sites as marshes, fens, and bogs (if not particularly acidic). Quite often, this taxon will be found in numbers on deciduous leaves or fallen, waterlogged wood.

General Distribution: Reported (Pilsbry, 1948) from northwestern California to Vancouver Island, British Columbia. This species seems equally common in the Olympics and Cascades; but becomes more sporadic in the Coast Range and Siskiyou Mountains, being found only rarely in southwestern Oregon.

Branson (1977, 1980) and Branson & Branson (1984) note this common species from several sites in western Washington and Oregon, under the name *Carychium occidentalis*. We found it at 14 of our 38 western Washington 1996 sample sites, giving it a rank of 15 of a total of 46 taxa. It does occur in northern Washington, so perhaps may occur in the Idaho Panhandle.

Idaho distribution: See above.

Status: Not yet definitely confirmed for Idaho; no special status required over most of its range, but further search in northern Idaho would be desirable.

Catinella (*Mediappendix*) *vermeta* (Say, 1829)
mudbank ambersnail

Discussion: Shell elongate, slender, width contained about 1 3/4 times in length; pale yellowish; surface irregularly wrinkled transversely; especially so on last whorl; often partly or wholly dirt-covered; spire high; adults with 3-3 1/4 whorls at height (length) of 10-11 mm; whorls strongly convex; aperture ovate, about 2/3 full shell length or less.

We follow Turgeon et al. (1998) in accepting this name for individuals commonly previously called *Catinella avara*. It should be noted here that several other succineids have been reported, more or less reliably, from either eastern Washington or eastern Oregon (east of the Cascades crest). Certain of these may occur here also: *Catinella* (*Mediappendix*) *gabbii* (Tryon, 1866); *Catinella* (*Mediappendix*) *rehderi* (Pilsbry, 1948); *Catinella* (*Mediappendix*) *stretchiana* (Bland, 1865); *Succinea oregonensis* Lea, 1841; *Succinea rusticana* Gould, 1846; *Oxyloma chasmodes* Pilsbry, 1948. We here follow the taxonomy of Roth (1997) and Turgeon *et al.* (1998).

Ecology: Often found along muddy stream banks or edges of lakes, ponds, marshes, and other perennially moist areas. Can be fairly resistant to drying; occurs in both shady and sunny areas.

General Distribution: Over much of North America, becoming more sporadic in the West. For eastern US distribution map, see Hubricht (1985). In the Western Division, this species has been ascribed to all of the provinces, *e.g.*, Bequaert & Miller (1973) for the Southwestern, under the name *Succinea* (*Novisuccinea*) *avara*. This taxon has likely been confused repeatedly with other succineids, so that re-identification should be considered.

Idaho Distribution: Seems to be present in several, possibly all counties; perhaps more common in the north and at low elevations and permanently wet sites generally.

Status: This species seems to be surviving quite effectively in the Eastern US. Western sites are less common; but the local status needs additional evaluation.

Cionella lubrica (Müller, 1774)
glossy pillar

Discussion: In the US, carried frequently under the name *Cionella lubrica* (*e.g.*, Pilsbry, 1948; Roth, 1997; Turgeon et al., 1998). European literature rather consistently prefers *Cochlicopa* (*e.g.*, Kearney & Cameron, 1979; Kearney, Cameron, & Jungbluth, 1983); and some US authors have followed , *e.g.* Bequaert & Miller, 1973; Hubricht, 1985).

Shell with about 5 1/2-6 whorls; height 5-7.5 mm; thin, smooth, very glossy, with high, elongate-oval to conical, blunt-topped spire; color yellowish corneous; aperture with indistinctly notched columella basally and thin callus rib just within; ovate, subvertical, no lamellae; outer lip evenly arcuate; whorls moderately convex; suture impressed. Animal dark gray to black.

Hubricht (1985) recognizes *C. lubrica*, *C. lubricella*, *C. nitens*, and *C. morseana* in the eastern US; the former three originally described from Europe. Generally, only one taxon has been noted from the western US, although Roth (1997) recognizes both *C. lubrica* and *C. morseana* from California. Pilsbry regarded it as strongly Western, although noting no California or Washington records. In our experience, *Cochlicopa* is widespread and indubitably native in the Washingtonian, Rocky Mountain, and southwestern provinces. For example, in the Lower Salmon River valley, Idaho, it was present at 12 of 213 sites, ranking it 15th out of 60 taxa (Frest & Johannes, 1995b). However, it may be questioned as to which taxon is represented. Idaho animals are white to light gray, as we noted in our Salmon River work (Frest & Johannes, 1995b). Roth (1997; pers. comm., 1999) regards both mentioned species as California natives and notes rare records from northern California. The genus' position in the Oregonian and Klamath provinces is more questionable. Baxter (1987) noted *lubrica* from southwestern Alaska; but S. Welty (pers. comm., 1999) did not find it there. Dall (1905) and Pilsbry (1948) also listed Alaska records, mostly or entirely from Northern Province areas of the state. Branson (1977, 1980) failed to note any western Washington records. Branson & Branson (1984) did not find it in western Oregon either. Roth & Pearce (1984) note a colony at Lynnwood, King County, Washington as introduced. Our 1996 western Washington sample sites, most from relatively natural areas, did not note it. The taxon is quite common, however, in Seattle and other urban areas, in each case clearly introduced and likely the European *C. lubrica*, with very dark body. Note that Bequaert & Miller (1973) regarded it as native to Washington and Oregon, but not to California.

Ecology: Generally found in relatively moist areas, ranging from prairies and grasslands to lowland woods; especially marsh and swamp borders, edges of floodplains. In Washington, often found in yards, in shrubbery, debris, or even along foundations.

General Distribution: For world distribution, see Kearney, Cameron, and Jungbluth (1983); for US distribution, Pilsbry (1948) and Hubricht (1985). Western distribution, of this or a similar taxon, has been summarized above. It seems likely that the genus at least is native to most Western provinces; but perhaps occurs native only in the more northern portions of the Oregonian (if there) and more southern edges of the Klamath (but perhaps only introduced).

Idaho Distribution: This small land snail is Holarctic in distribution. In many areas, it is a synanthromorph (e. g., western WA cities such as Seattle, Tacoma, Olympia) and is found in a variety of habitats, covering a broad range of substrates and elevation. Locally (Lower Salmon River valley: Frest & Johannes, 1995), it has been noted from 12 sites (fairly frequently for a small species), mostly rather xeric or mesic. These localities are fairly scattered over the survey area along the main Salmon River corridor (Frest & Johannes, 1995, Appendix C8). It is associated with a variety of large and small taxa (Table 3), making succinct faunal characterization difficult. The glossy pillar is also widely distributed in the Oregonian, Washingtonian, and Rocky Mountain provinces, as well as in eastern North America. There is no danger of regional extinction and little of local extirpation, and we regard the species as locally common.

We strongly suspect, owing to minor shell differences and consistent body color differences, that the native western US populations are a separate species. These are found in quite pristine habitats generally and in areas very unlike those in which the synanthromorph thrives. The definitely introduced populations often have a black animal, while the native populations have light gray bodies. We have not dissected these for comparison as yet; and also note the likelihood that *Cochlicopa* (or *Cionella*) in the western US has more than one taxon, as in the eastern US,. Note that most European authors prefer *Cochlicopa* for the genus, while most American (*e.g.*, Turgeon et al., 1998) use *Cionella*. The black form has been seen in northern Idaho, likely introduced.

Status: We regard this taxon as possibly partly non-native in the study area and hence accord it no special status despite its seeming rarity. However, LSR populations deserve further attention.

Columella "edentula" (Draparnaud, 1805)
toothless column

Discussion: The specific identity of North American *Columella* needs restudy. According to Hubricht (1985), *C. simplex* Gould is a valid taxon applying to many eastern US occurrences; but the genus may have other taxa present, much as in western Europe and the UK (for the latter, see Paul (1975). Comparison of western specimens with many eastern US lots indicates that the common species in each are not identical. Pilsbry (1948) ascribed some Oregon lots to *Columella edentula*, the widespread European species, noting that they "resembled the typical European *edentula* closely". Limited comparisons with European lots indicated a similar conclusion to us also; but note that, as Pilsbry also commented, western US individuals are generally smaller. Close anatomical and other work is required here. Pilsbry (1948) also recognized *Columella alticola* in the Rocky Mountain and some western states. This was recognize as a full species in Turgeon *et al.* (1988) but downgraded to a subspecies of *Columella columella* in Turgeon et al. (1998). The Washington specimens definitely are not *Columella simplex* Gould, 1841, the most common eastern US species in our experience.

Note that Branson (1977) reported *Columella alticola* from the Olympic Mountains, Washington; but not *C. edentula*. We found this taxon quite common in the same area; perhaps the most common taxon after *Nearctula* sp. No *Columella* is reported from the Washington Cascades or the Oregon Cascades and Coast Range by Branson (1980) and Branson & Branson (1984), nor for that matter from northern California (Branson & Branson, 1991); but the genus is common in these areas also. Specimens possibly attributable to *C. alticola* are fairly common at Washington sites; but so far have not been seen in southwestern Oregon. We noted *C. "edentula"* from 18 sites and *C. alticola* from 8 sites in our 1996 sample of 38 western Washington localities. *Columella* species thus ranked 12th and 19th or 20th out of 46 taxa in that sample set.

Ecology: *Columella* in this area is found frequently in forest litter and under sticks and branches on the forest floor; it is at least as frequently seen crawling on smaller deciduous tree and shrubs, often those taxa which form boscades, such as *Alnus*, *Cascara*, and *Cordylus*, and has been found up to 5 m above ground level. The arboreal occurrences are often with *Nearctula* n. sp. . The genus has also been noted in numbers frequently on sword fern (*Polystichium munitum*) stipes. Litter sites frequently include a variety of small taxa, such as *Pristiloma lansingi*, *Euconulus fulvus alaskensis*, *Vertigo columbiana*, *Planogyra clappi*, *Carychium occidentale*, and *Striatura pugetensis*, as well as more common large genera, such as *Vespericola*, *Monadenia*, *Haplotrema*, and *Ancotrema*.

General Distribution: Western US occurrences stretch from arctic Alaska to northern California. The taxon appears much less common in the Washingtonian as compared to the Oregonian, Klamath, and Rocky Mountain provinces. Pilsbry (1948) did not note California occurrences; but Roth (pers comm., 1998) has noted this species in northern California. We have collected it in Del Norte County.

Idaho Distribution: Noted from northern Idaho; but note near absence form LSR area. Probably more common in the north than currently recognized.

Status: No special status is needed elsewhere in its range; but possibly Idaho populations are an exception. Although many of the smaller land snail taxa appear somewhat less common in northern Idaho than they do elsewhere in their range, this species could be quite widespread and common in a limited area even here. Note that *Columella alticola* (or *Columella columella alticola*, as recognized in Turgeon et al., 1998) occurs also in Washington, British Columbia, Wyoming, and Montana. Occurrence in Idaho is probable, particularly in the northern portion.

Cryptomastix (*Cryptomastix*) *mullani mullani* (Bland & Cooper, 1861)
Coeur d'Alene oregonian

Discussion: This regional endemic (Washingtonian and Rocky Mountain provinces) is still common in scattered sites within the historic range and is in no danger of extinction currently, despite the loss of some historic sites and widespread environmental modifications through much of its known area of occurrence. It is not, however, particularly widespread in the survey area (4 sites [Frest & Johannes, 1995, Table 3)), although locally common. We regard it as rare in the Lower Salmon River Valley, and most likely to be found at moist mature forest sites at moderate to high elevations.

This mesophile taxon is often found associated with *Oreohelix strigosa depressa* and related forms; *Anguispira kochi occidentalis*; and *Allogona ptychophora ptychophora*. As such sites are now rare in the survey area, we do not expect large numbers of additional sites on BLM lands, although populations on National Forest holdings are quite possible. Populations are most frequent in the Idaho Panhandle, mostly north of the Clearwater drainage.

Cryptomastix (*Cryptomastix*) *mullani olneyae* (Pilsbry, 1891)
Spokane oregonian

Discussion: Like the foregoing taxon, this subspecies of *mullani* is a common and widespread regional endemic, characteristic of somewhat mesic-slightly xeric, often forested sites in the Washingtonian and Rocky Mountain provinces. It has been reported previously from the survey area. We found it at 22 LSR sites scattered loosely over the whole survey area (Frest & Johannes, 1995, Appendix C14); most colonies are on major tributaries, rather than very near to the mainstem Salmon River. Land snail associates are much more varied locally than typical for sites with the subspecies and include numerous mesic species of *Oreohelix* and *Cryptomastix*, plus such taxa as *Allogona ptychophora ptychophora* and *Anguispira kochi occidentalis* (Table 3). As with localities elsewhere, the regolith is varied, and the taxon has been reported from a wide range of elevations.

We regard this subspecies as locally common and in no present danger of extinction, here or in most of its historic range (Table 2). It is fairly common in the Panhandle counties and in adjoining WA and MT; in the latter, it appears to be the only *Cryptomastix*.

Discus whitneyi Newcomb, 1864
forest disc

Discussion: This is the taxon long known under the name *Discus cronkhitei* Newcomb, 1865. For discussion of the name and validation, see Roth (1988b). Shell depressed; thin; buff to light brown, very low conoid spire with convex whorls; sutures deeply impressed; wide umbilicus contained about 3 times in the diameter; nepionic whorls smooth; teleoconch whorls with distinct retractive riblets; whorls about 4 1/2 at 6.1-6.5 mm diameter, evenly expanding; aperture rounded, unmodified.

Difficult to confound with any other native NW taxon. Western examples are often reddish-brown; and the body color is often light gray or nearly unpigmented; in eastern examples, the tentacles are almost black and the body color distinctly grayish. Very few NW examples attain the full size.

Ecology: In the eastern US, found in very moist situations varying from forests to prairies and roadsides and including marshes, swamps, and floodplain edges; mostly lowland situations. In the NW, found in two site types: 1) edges of floodplains of larger, more level streams, often at low elevations; and 2) at relatively high elevations, in more open habitats, including rock piles, talus, and areas above timberline. Commonly found in wet forest situations in the East; rarely in the West; but an unfortunate common name in both cases.

General Distribution: See Hubricht (1985) for eastern distribution. Found over most of the western US as well, but far more sporadically. Relatively common in the northern portions of the Oregonian Province, at least as far as the Aleutian Islands (*e.g.*, Roth & Lindberg, 1981) and central Alaska (Baxter, 1987); and in much more xeric situations in the Washingtonian, Rocky Mountain, and Southwestern. In the southern Oregonian and Klamath provinces, the taxon is present but rather sporadic.

Branson (1977) notes two sites from the Olympic Peninsula (under the name *Discus cronkhitei*); Branson (1980) one site from the Washington Cascades. Branson & Branson (1984) note no Oregon sites. Some idea of relative abundance may be inferred from our 1996 western Washington site sample, in which of the 38 sites total, *D. whitneyi* was noted at one (ranking: 35-46/46).

Idaho Distribution: Despite the common name, this species is found in a wide range of habitats, including swamp and floodplain edges and prairies, as well as forests. Generally, it is found in relatively moist places. We found it to be very rare in the Lower Salmon Valley (2 sites: Tables 2- 4). Both were at moderate elevations, in relatively moist situations, and some distance from the mainstem Salmon River (Appendix C20). We think it is very likely that many other sites exist at higher elevations in the study area, so that local extirpation is not likely to be a problem. However, three things should be noted about Lower Salmon River populations. The first is the species' apparent absence from the many spring-associated sites we collected at lower elevations. The second is the lack of *D. whitneyi* in litter samples from the area (see Table 3 and Appendix 1). Finally, live specimens from the Slate Creek drainage (site 176) appear to differ in shell morphology and body color from any other lots we have seen, and our ascription of material from this site to *Discus whitneyi* is only tentative. The local status of this species requires further investigation.

Specimens form southeastern Idaho are not infrequent, either in drift samples or associated with springs. These appear more or less typical. The species is also found in the more northerly Panhandle counties, often along river valleys but in less open situations than in southern Idaho, where sites may be quite exposed.

Status: Nationwide, this taxon continues to be well distributed. It is uncommon to rare locally; but needs additional work to determine local status.

Euconulus fulvus alaskensis (Pilsbry, 1899)
western brown hive

Discussion: The most distinctive feature of this western US subspecies is the finely and evenly radially striate upper surface with no spiral striae, together with the nearly smooth (no or very rare spiral striation) base. Pilsbry (1946) described this subspecies from immature material. Mature specimens can have from 5-6 whorls and may reach a diameter of about 4.0 mm. As noted by Pilsbry, this subspecies has a lower whorl count at comparable size to a given *E. fulvus fulvus*. The upper surface of the latter is generally glossy, with spiral striae fine, but distinct, if patchy; while radial striae are indistinct and irregular. The upper surface of *alaskensis* is characteristically silky, due to the very fine, regular radial striae. The spire in *alaskensis* is often slightly lower (more dome-shaped above); and the periphery is often slightly angular.

Thus far, this is the only species of *Euconulus* commonly encountered in the Pacific Northwest. It requires further study to delineate its distribution in the Rocky Mountain and southwestern states; and possible distribution in the middle and eastern US should not be ruled out. We have noted one nearby introduction of the European taxon *Euconulus alderi* at Klamath Falls, Klamath County, Oregon, in 1997, so that it is possible that other such

waif populations may be found in the survey area. So far as we are aware, *E. alderi* has not been previously reported in the US.

Ecology: Found in a variety of situations, including moist forests, relatively open, moist prairies, and occasionally rock piles. This taxon is often abundant in moderately moist areas. Quite frequently encountered in moderately to highly diverse locales, often with several other small taxa. This subspecies seems to range from near sea level to at least subalpine locales and is perhaps as common or more so at middle to high elevation sites.

General Distribution: Well distributed originally from coastal Alaska to the San Bernardino Mountains and the Sierra Nevada of California. Easterly distribution uncertain, due to frequent confusion with the nominate form. Probably characteristic of the Washingtonian, Oregonian, Klamath, and Californian provinces, with more sporadic representation in the Southwestern and Rocky Mountain provinces. Noted under the name *Euconulus fulvus* by Branson (1977, 1980) and by Branson & Branson (1984) from a total of 15 sites. In our 1996 western Washington 38 site sample, this subspecies was present at 28 sites, giving it an occurrence ranking of 4 among the 46 taxon total.

Idaho Distribution: We found it at only 5 LSR sites (Tables 3-4) in the survey area, from which it had not been previously reported (Table 1). Sites are along main tributaries as well as the Salmon River proper (Appendix C21). More detailed litter sampling would probably turn up additional sites, particularly at higher elevations. We regard it as uncommon in the Lower Salmon River area, but as likely in no danger of local extinction. The subspecies' subpopulations appear healthy throughout most of its range. This species also occurs in forested sites in northern Idaho

Status: This taxon appears to be relatively common in Idaho and is not in need of special status here or elsewhere in its range, although likely absent from the majority of its historic range.

Hawaiia minuscula (Binney, 1840)
minute gem

Discussion: Shell with very low conoid spire, almost flat above; but aperture descending, ovate, height and width about equal; nepionic whorls smooth; teleoconch with distinct but uneven radial striae above; almost smooth below; diameter to 2.5 mm at 4 whorls; umbilicus broad, shallow, contained 2.8 times in diameter; suture well-impressed; whorls evenly, strongly convex; slowly expanding, last almost tubular; shell white, bluish, pale gray, or flesh-colored from dried body; often only semitransparent.

Locally, only *Vitrea contracta*, *V. crystallina*, and *Microphysula cookei* are very similar This taxon has a much wider umbilicus than the rest; both *Vitrea* species have very thin, generally glossy shells, without distinct radial striae; *M. cookei* shells often are similar in color and surface texture; but have more whorls, which are also more rapidly expanding; and a quite small, well-like umbilicus.

Ecology: Common in a variety of settings in eastern North America, including prairies, grasslands, and woodlands; wet areas; and somewhat xeric settings as well. Also frequent along floodplains.

General Distribution: *H. minuscula* is general in the eastern states and into southern Canada. Pilsbry (1946) noted that it was more sporadic in the Rocky Mountain states; he had no records from Washington, Oregon, Idaho, Nevada, and Utah; and only southern California records. The taxon is reported now from Wyoming (Beetle, 1989) and Nevada. It is clear from Bequaert & Miller (1973) that the species (or at least the genus) is of common occurrence in the Southwestern Province; and Roth (1997) accepts it from the Californian. There are a fair number of records in the Washingtonian. For example, Frest & Johannes (1995b) found it at 8 of 213 Lower Salmon River, Idaho sites, ranking it 22 of a total of 60 species.

Oregonian Province records are more problematic. Dall (1905) and Pilsbry (1946) list Alaska and British Columbia records, all derived from Dall. The British Columbia records are from early-settled areas in the extreme south of the Province. There would also be a possibility that the Alaska and British Columbia records are either

introductions or misidentifications (say, for *Microphysula cookei*), or a mix of both, as seems likely for Washington *Cochlicopa* (q.v.). Though this is indeed a "weedy" species, native sites tend to be in the central and southern US, becoming quite sparse toward the US northern border. Similarly, Oughton (1948) found this species in southern Ontario (not central or northern). Thus, sites as far north as reported by Dall (1905) may be questionable. Branson (1977) reported a single specimen from the Olympic Peninsula; no sites were noted from the Washington Cascades by Branson (1980), nor from western Oregon by Branson & Branson (1984). We have not noted it in any of our western Washington or western Oregon sites. Certainly, there is some possibility of survival if introduced. Capizzi (1961) reported it as an adventive from Central Point, Jackson County, Oregon. We are so far unconvinced of native occurrence in the Oregonian Province.

Idaho Distribution: While this small species is quite widespread geographically, and something of a synanthromorph, it is not particularly abundant or common in western U.S. sites (see, *e.g.*, Branson, 1977, 1980; Branson & Branson, 1984). Locally, we found it rarely at a total of 8 LSR sites (Tables 3,4). Locality distribution was sporadic through the central part of the survey area, with sites both along the mainstem Salmon River and major tributary streams (Appendix C22). The habitat ranges from rather dry talus to moist forested situations; and this species was probably overlooked at some sites because of its small size.

Hubricht (1985) regards it as a species of bare ground situations and did not find it in leaf litter. We have found it in such samples quite frequently, both in forest and prairie situations, both in the Midwest and western U.S. While *in toto*, it is ranked as very rare locally (Table 2), it is unlikely to be extirpated by human activities and should not be regarded as a Sensitive species.

This taxon has been recorded also from Rocky Mountain realms (e.g., Pilmore, 1989: Wyoming) as well as from Southwestern Province sites (Bequaert & Miller, 1973) and Nevada. The Southwestern sites are not in dispute; but we are less certain about some of the Rocky Mountain occurrences. Idaho examples, from the Snake River Plain, are rare and could be introductions. Note that this taxon could well have been classified with other introduced species; but because of its uncertain status, we place it here.

Status: As no definitely native sites are known; and native occurrence on present evidence is unlikely, no special status would be appropriate.

Haplotrema (*Ancomena*) *vancouverense* (Lea, 1839)
robust lancetooth

Discussion: For excellent phylogenetic analysis and review, see Roth (1991). For basic anatomy and illustrations, see Pilsbry (1946) and references therein. This is perhaps the most broadly distributed western species, with sites ranging from the Coast to northern Idaho and from Alaska to northern California. Branson (1977, 1980) and Branson & Branson (1984) list this taxon from a variety of western Washington and Oregon sites. At our representative sample of 38 western Washington sites, collected in 1996, this species was present at 15 sites and ranked 14th (out of 46) in overall occurrence.

Ecology: Same as for *Ancotrema* (*Ancotrema*) *sportella sportella* above. *Haplotrema* (*Ancomena*) *vancouverense* occurs in a number of land snail communities, ranging from low diversity assemblages, in which it and/or *Ancotrema* (*Ancotrema*) *sportella sportella* may be the only large taxa present, to high-diversity assemblages, in which it is subordinate in numbers. In most assemblages, it is a relatively common taxon.

General Distribution: Same as for *Ancotrema* (*Ancotrema*) *sportella sportella* above.

Idaho distribution: Seems to be widely distributed in forest situations in northern Idaho, but exact abundance uncertain. Quite common elsewhere in its range.

Status: No special status needed here as yet, due to lack of information. See comments on *A. sportella sportella* above. While this taxon, like *sportella sportella*, has lost most of its range, colonies remain scattered throughout and the species is one of the most commonly seen land snails in many areas, although not in Idaho. Status here needs further study.

Helicodiscus salmoneus Binney, 1886
Salmon coil

This is the most widespread of the smaller land snail species in the Lower Salmon River Valley. As the name implies, the type locality is in the Lower Salmon River valley, and it has long been regarded as characteristic of this area. No very precise site has yet been designated (Figure 2); although there is a need to do so. We found it at 34 sites (Table 3), rather impartially distributed through the survey area (Appendix C23), in terms of both elevation and stream size. This species seems to be more distinctly xerophile in its habitat preferences than are many of the eastern U.S. species. Most sites were in taluses or rock outcrops at low to moderate elevations; typically, localities were comparatively dry and open and in sage scrub.

East of the Mississippi a number of *Helicodiscus* species occupy the Cumberland and Interior provinces; diversity of the Helicodiscidae is quite limited in the western U.S., with this species and *Speleodiscoides spirellum* the only native taxa. *Helicodiscus salmoneus* is widespread in the eastern part of the Washingtonian mollusk province; and this regional endemic is probably currently in no danger of extinction, regionally or locally.

Microphysula ingersolli ingersolli (Bland, 1874)
spruce snail

This small taxon is of scattered but relatively common occurrence in part of the western U.S., especially the Washingtonian Province. The genus as a whole is characteristic of the Western Division provinces. The subspecies is most often found in talus and rocky area, often forested but somewhat dry- the taxon is best characterized as a mesophile-slight xerophile. Its Oregonian Province counterpart, *M. cookei*, appears to be a forest mesophile. Perhaps because of the scarcity of such habitats in the Lower Salmon River area, the species is very rare locally (Table 2). We found it at only 3 sites, situated between Riggins and Slate Creek and off the Salmon River proper.

We see little danger of complete extirpation of this taxon; but local extinction is a distinct possibility unless known or other sites are protected.

Nesovitrea binneyana occidentalis (Baker, 1931)
western blue glass

Discussion: Adult shell diameter 3-3.5 mm at 4 whorls; spire low conoid; whorls evenly convex; aperture rounded -lunate; shell glossy, thin, almost colorless; spiral sculpture fine but distinct; umbilicus small; contained in diameter about 5 times; suture not well-impressed; animal bluish-black.

We follow Riedel (1980), Hubricht (1985), Roth (1997) and Turgeon et al. (1998) in using *Nesovitrea* rather than *Retinella* in association with this species, unlike Pilsbry (1946). This taxon differs from the nominate form largely in that the spiral sculpture is well-developed; most specimens are smaller than *N. electrina*, which also lacks the spiral sculptural feature.

Ecology: The nominate form, according to Hubricht (1985) is found in leaf litter in upland woods. Western occurrences are frequently along floodplain or marsh edges, sometimes at considerable elevations. Sites are often very moist but may be partly or largely open.

General Distribution: Pilsbry (1946) records this taxon as ranging from southern British Columbia in the Oregonian south to northern California. It is also reported from Washingtonian and Rocky Mountain localities; but not from the Southwestern or Californian provinces in our usage. Pilsbry (1946) notes localities in Clallam and Snohomish counties, Washington. Branson (1977) reports this taxon from 4 sites on the Olympic Peninsula; Branson (1980) from 4 Washington Cascade Range sites; Branson & Branson (1984) from a single site in extreme northwestern Oregon. In our 1996 sample of 38 western Washington sites, we found this taxon at just two, ranking it somewhere in the 30-34th position out of 46 taxa total. Roth (1997) accepts this taxon as native to California.

Idaho distribution: So far, not noted by us live in Idaho; but occurs in northern Washington; probably present in small numbers of sites. Noted elsewhere in western Oregon infrequently; also occurs on the east side of the Cascades in both Washington and Oregon. Recently dead shells from southeastern Idaho spring sites (Bear R. drainage) suggest live occurrence there as well, at least sporadically.

Status: While this taxon has lost most of its historic range, it still remains well distributed in it in many small colonies. It is possible that protection might be advisable in the survey area, if sites continue to be as sparse as first-year research suggests.

Nesovitrea electrina (Gould, 1841)
amber glass

Discussion: Shell low conoid; spire strongly depressed; adults 4.5-5.2 mm at 3 3/4-4 1/4 whorls; shell glossy, transparent, faint yellow or green; sculpture of crowded radial grooves, distinct on upper surface but not reaching base; umbilicus narrow, contained about 4.5 times in full diameter; aperture thin, simple, rounded-ovate; whorls rather slowly expanding; suture not greatly impressed; animal almost black.

The sculpture of radial grooves distinguishes this taxon from any *Oxychilus* species. *R. binneyana occidentalis* generally has faint spiral striation and lacks the radial grooves.

Ecology: In the eastern US, Hubricht (1985) characterizes this as a species of low, wet ground; floodplains, meadows; and pond and marsh edges. Quite common in prairies and along railroad embankments and tracks. Western US sites are similar, with floodplain edges perhaps being most frequent. High elevation sites also occur.

General Distribution: Found though most of southern Canada and the northern half of the eastern US, with the exception of the northern-most areas. Present in Alaska according to Dall, 1905; Pilsbry, 1946) but not noted by Baxter (1987). Note that Dall (1905) does not recognize *N. binneyana occidentalis* as occurring in Alaska. Pilsbry (1946), relying on Dall records (only one Alaska occurrence confirmed by H. B. Baker), thought it generally spread along the Alaskan coast " to Point Barrow on the Arctic Ocean". Occurrence this far north needs to be confirmed. Generally distributed in much of the central and eastern US and adjacent Canadian range; more sporadic in the western States and Alaska. Pilsbry (1946) recorded it from eastern Washington and Oregon sites (Washingtonian Province); Roth (1997) accepts native California sites. Branson (1977) notes it as *Retinella electrina* from one Olympic Peninsula site; Branson (1980) from three west Cascades, Washington sites. Branson & Branson (1984) did not encounter this taxon in Oregon.

Idaho distribution: So far, we have not collected this taxon except rarely in southeastern Idaho (Bear R. drainage); but its widespread occurrence, even though sporadically, is still possible; based on old records, either in the Panhandle area or in extreme southeastern Idaho (Wasatch ranges).

Status: No special status is needed for this taxon over most of its range, even though total areal extent is very likely very much reduced in the western states (no problem nationally). Colonies remain numerous and well-distributed, except in the coastal western US, where it is possible that further work could establish advisability of protection.

Oxyloma nuttallianum nuttalianum (Lea, 1841)
oblique ambersnail

Discussion: Shell elongate, aperture about 3/4 length of shell; whorls 3 at width of 8 mm and height of 12.5 mm; aperture strongly oblique; more or less rounded below; shell yellow, transversely striate, transparent; spire rather elevated; suture impressed.

Ecology: Perennially wet areas, such as marsh or fen borders; edges of stable streams; lake or meander cut-off borders; often with dense *Typha* or *Scirpus*.

General Distribution: Dall (1905) defined the range as from southern British Columbia (Vancouver Island) to California.

Idaho Distribution: Uncertain; but almost certainly includes this area.

Status: There is too little information of recent vintage available to allow accurate determination. Many of the habitats particularly preferred by this and similar taxa are particularly impacted by historic human modifications.

Paralaoma caputspinulae Reeve, 1855
striate spot

Discussion: Shell with low conoid spire; strongly convex whorls with deeply impressed sutures; color light yellowish olive to light brownish olive; nepionic whorls with spiral striae; teleoconch ornament consists of rather separated radial riblets with fine microscopic spiral striae; narrow and deep umbilicus, contained about 3.6 times in diameter; diameter 2.0-2.4 mm with 4-4 1/2 whorls.

This taxon somewhat resembles *Punctum hannai*, *P. randolphi*, and *Planogyra clappi*. *P. caputspinulae* is larger, darker colored, and less tightly coiled (has a slightly proportionately larger umbilicus than *P. hannai*). *P. randolphi* is smaller, has a higher spire, and the riblets are much more closely spaced; the umbilicus is also distinctly narrower and the nepionic whorls are smooth. *P. clappi* has a flatter spire and very wide umbilicus; the nepionic whorls are microscopically granular here also.

This taxon was long known locally as *Punctum conspectum* (Bland, 1865), type locality Oakland, California. B. Roth (1985, 1986) pointed out its synonymy and the final disposition was made by Roth (1987). This is the taxon that, until the recent work of Roth (1986a), was known either as *Punctum conspectum* (Bland, 1865) or as *Punctum pusillum*. Roth presents strong reasons for regarding the West Coast specimens as examples of the widespread tramp, rather as a native or European species.

Ecology: Most typically, this very small species is found in moist and shaded forest environments in the Pacific Northwest. It is most easily collected in numbers in litter samples. Found in a variety of situations locally, ranging from occurrence as far north as the Aleutian Islands and other parts of Alaska (Baxter, 1987) to forested locales to semixeric sites, including talus and rock piles. Quite commonly found with other small taxa, including *Vertigo modesta modesta*, *Pristiloma lansingi*. *P. chersinella*, and *P. arcticum arcticum*, *Planogyra clappi*, *Punctum randolphi*, *Discus whitneyi*, and *Euconulus fulvus alaskensis*.

General Distribution: The world distribution of this rather tramp species has been summarized by Roth (1986, 1987). Locally, it is known from throughout the Oregonian and probably all of the Washingtonian provinces into

the Klamath, Southwestern, and Californian. Pilsbry (1948) noted Washington, California, and Oregon sites. Branson (1977) reported it from a single site; Branson (1980) from 6 sites (all under the name *Punctum conspectum*). Our 1996 western Washington 38-site sample may provide some perspective on relative abundance. It was noted at 12 sites, giving it a ranking of 17 among the 46 taxa noted.

Idaho distribution: In western Washington, this is frequently a forest taxon, but found also in drier sites, as also in eastern Washington. So far, we have found this species in Oregon only rarely, mostly in rather dry areas in eastern Jackson County. It occurs also in adjoining Klamath County as well. It nevertheless is very rare locally. We found the species live at a single LSR site (Frest & Johannes, 1995, 41: see Appendix A and B, Appendix C54 for details), associated with *Planogyra clappi*, *Cryptomastix harfordiana*, and *Allogona ptychophora ptychophora* (Table 3). The locality is unusually moist and mossy for a lowland Salmon River site; most such previously existing have been cleared or otherwise modified.

Status: This species appears to be in good condition in most of its range. While the striate spot has lost most of its habitat, it is currently in no danger of extinction, in part because of its status as a regional endemic with a comparatively broad areal distribution. Western, particularly SW Oregon, sites are not common; but more information is required to determine local status.

Partly as a result of wholesale habitat change, we regard it as very rare locally (in Idaho) and in real danger of extinction on BLM lands. Interestingly, we have not found it on higher elevation forested sites in Nez Perce National Forest as yet. Occurrence in more northern Idaho is possible, but unconfirmed as yet.

Planogyra clappi (Pilsbry, 1898)
western flat-whorl

Discussion: This small taxon is found mostly at sites with comparatively diverse terrestrial faunas, including other small taxa. Note that here is some resemblance to both *Punctum* (*Toltecia*) *hannai* and to *Paralaoma caputspinulae*. This species has a very low, almost flat spire; the nepionic whorls are granulate; and there are no clear minor lamellations between the spaced major thin, periostracal riblets. *Hannai* has a more dome-shaped spire; striate initial whorls; and about 5 minor riblets between the majors; the diameter is commonly 1.4 mm or less. *Caputspinulae* has a diameter of about 2 mm, as does this species; but has a distinctly conoid, higher spire and a comparatively narrow umbilicus; it also has striate initial whorls.

Ecology: Most often found in relatively moist forests, at low to subalpine elevations. More rarely this taxon can occur in rock talus or outcrops, generally also at least partly forested, or in small-scale marshes or meadows or along small stream or spring runs.

General Distribution: This species has been reported mostly from the Oregonian Province, notably (in Pilsbry, 1948) from southwestern British Columbia to northwestern Oregon. We have also seen it rather commonly from southwestern Alaska, although it is not reported there by Baxter (1987). Roth (1985, pers. comm., 1998) has reported this taxon from two sites in Trinity and Mendocino cos., California. Branson (1977, 1980) report this common taxon from five western Washington sites; and four western Oregon sites are noted in Branson & Branson (1984). In our 1996 western Washington site sample, this taxon was present at 16 sites and ranked 13th of 46 species.

Idaho Distribution: This is primarily a species of the Oregonian and Washingtonian provinces, only recently reported from northern California (Roth, 1987) and not previously known from this area. This small taxon is mostly a forest snail, especially common in moist lowland areas and frequently encountered in litter samples. Its preferred habitat is rare in the Lower Salmon River Valley; and the western flatcoil is thus predictably rare locally. We found it live at a single site (Appendix C51). This site is also the only local locality for *Paralaoma caputspinulae* (*q.v.*, above).

On a broad scale, much suitable habitat remains for this species even though the majority of forest in its range has been logged, and the species is not currently in danger of extinction. Local extirpation, however, is quite possible. We expect that sites remain on Nez Perce National Forest holdings, although our sites there so far have not had this species. it should be relatively common in the northernmost Idaho counties, although not yet reported reliably from there.

Status: *P. clappi* appears to be relatively common from southern Alaska to northwestern Oregon, in which range it is found in most litter samples from moist forested locales. To the east, its range appears to be much more sporadic; and thus far it seems to be quite rare in Idaho. No special status is desirable over most of its known range; but its apparent rarity in Idaho needs further attention

Pristiloma (*Priscovitrea*) *chersinella* (Dall, 1886)
blackfoot tightcoil

Discussion: This is a moderate-sized *Pristiloma* species, with 4 1/2-5 1/2 whorls at maturity (diameter ca. 3.5 mm); small, open umbilicus; evenly convex whorls with periphery at midpoint; low, conic spire; and glassy, yellow or yellowish-green shell. The considerable amount of black pigment, especially on the foot, inspired the common name and differs from the pigment pattern of most other *Pristiloma* species. *P. wascoense* also has an open umbilicus and conic spire; but is smaller, more depressed; and merely perforate.

Ecology: This species is a high-ground form, most often seen at relatively dry and partly to wholly open sites. It can frequently be found on rocky ground or in talus. Common associates include *Vitrina pellucida* and *Vallonia cyclophorella*. It has been noted in sage scrub and mountain mahogany communities, and in area with manzanita and similar shrubs.

General Distribution: Formerly reported from the east side of the Cascades in southeastern Oregon and from Sierra Nevada (California) sites (Pilsbry, 1946). We have noted this taxon from 2 sites in eastern Jackson County, Oregon. These locales are on the west side of the Cascades Range, at relatively high elevations near to the Cascade crest. *P. chersinella* is relatively common in the eastern Cascades Winema National Forest, Klamath County, Oregon, where it occurs much more widely, from low to high elevations and in a variety of plant communities, including Ponderosa pine and sugar pine-Douglas fir forests, as well as rock piles and sage and manzanita scrub. Generally, it is not found at very moist sites. A single specimen was reported under the name *Pristiloma* cf. *chersinella* from the Coquillle River drainage, Coos County, by Branson & Branson (1984). This is more likely to be *P. wascoense*, a possibility noted by the Bransons.

Idaho distribution: No definite sites , although some reports of *Pristiloma wascoense* could refer to this taxon. Ass it now appears fairly widespread in the Washingtonian, it likely occurs at higher elevations in central and northern Idaho.

Status: So far as we are aware, this taxon is not in need of special status in most of its historic range, even though it appears to be absent from heavily logged portions (most) of it. It also appears to be absent from area with geologically recent volcanic activity, such as the eastern parts of Klamath National Forest; parts of Mt. Lassen Volcanic National Monument; and the eastern parts of Deschutes National Forest. Numerous small separated colonies appear to remain in much of the historic range. On the west side of the Cascades, however, it appears to be quite rare and limited in occurrence; with further study, special status may be appropriate regionally.

Punctum (*Punctum*) *randolphi* (Dall, 1895)
conical spot

Discussion: Shell reddish-brown, with dull silky luster, low conoid spire; whorls typically 4-4 1/2 at diameter of 1.1-1.4 mm; sculpture of fine, evenly spaced transverse riblets and weak, very fine striae; umbilicus small and deep, about 1/5 full shell diameter; aperture obovate, somewhat oblique, unmodified; nepionic whorls smooth.

Both *Paralaoma caputspinulae* and *Punctum hannai* somewhat resemble this taxon; but can be distinguished by their larger shells, with more flattened spires. Both also tend to have the riblets more widely separated (interspaces distinctly wider than riblets). According to Roth (1985), *randolphi* can be distinguished by the following: "the umbilicus is narrower, the spire higher, radial ribbing more delicate and spiral microsculpture less pronounced." *Planogyra clappi* has strongly periostracally fringed riblets, also widely separated; and the spire is nearly flat, with a very wide umbilicus. *Punctum californica* may be difficult to distinguish from this taxon. It is said to be slightly larger; lower; and with less conspicuous riblets.

Ecology: Found most often in moist forest litter at a wide range of elevations. Also common in very moist, rather more open situations, such as swamp, marsh, or fen edges and in moist rock piles or talus. In the Oregonian area, often found with a variety of other small land mollusks, including *Carychium occidentale*, *Pristiloma lansingi*, *Euconulus fulvus alaskensis*, *Striatura pugetensis*, *Vertigo columbiana*, and *Columella* spp.

General Distribution: Well-distributed in the Oregonian and Washingtonian provinces. In the Klamath Province, seems to be well-distributed to the California border. Roth (1997) does not include this species, although Roth (1985) does accept two sites.

Idaho distribution: This is one of the most commonly encountered small land snails in western Washington and Oregon. It has been reported from northern Washington, southern British Columbia, and from western Wyoming (the latter records are somewhat doubtful),. Occurrence in northern Idaho is quite possible.

Status: Likely, this taxon requires no special status anywhere in its historic range except Idaho, if it occurs there, even though it has been extirpated from most of it. Numerous, widely distributed small colonies appear to remain in Washington and Oregon.

Pupilla hebes (Ancey, 1881)
crestless column

Discussion: This small pupillid is a regional endemic, especially characteristic of the eastern part of the Washingtonian Province and portions of the Rocky Mountain Province. It is most typically found in somewhat open, dry, and rocky habitats, generally at lower elevations; but is absent from very dry sites. It sometimes occurs in mountain meadows. Little substrate preference is evident. Associates may include a variety of small and large taxa, such as *Vallonia cyclophorella*, *Cochlicopa lubrica*, *Helicodiscus salmoneus*, *Vertigo* spp. such as *modesta,* various *Oreohelix* spp., *Allogona ptychophora ptychophora*, etc. Local occurrences with *Cryptomastix harfordiana* and *Cryptomastix* n. sp. 5 are frequent.

Lower Salmon River occurrences are fairly typical, although the genus *Vertigo* is very rare locally. This taxon was noted at 9 sites in the area from the mouth of the Rapid River north to a point between the mouths of Rock Creek and White Bird Creek (Appendix C55). It is uncommon in the region generally (Table 2), but is in no substantive danger of local extirpation. Sites are mostly on the Lower Salmon River proper; but sites at moderate elevations in major tributaries are known also. Sites are also noted from the Rocky Mountain Province portion of the state, mostly in the greater Wasatch ranges (southeastern Idaho). Occasional occurrences from the Snake River Plain are also notable. This taxon probably does not need special status.

Striatura (*Striatura*) *pugetensis* (Dall, 1895)
northwest striate

Discussion: This species closely resembles its eastern and central US counterpart, *S. milium*. Western Division specimens are also small, greenish-yellow, with a very low, broadly umbilicate spire of 3 rather slowly expanding whorls at an adult diameter of about 1.2-1.5 mm; but the nepionic whorls are nearly smooth (vs. first smooth; next 1/2 spirally striate) and the spiral striation is weak to absent as compared to the fine transverse ribs (vs. strong, essentially dividing the transverse ribs into beads).

Branson (1975) rather inexplicably redescribed this well-known taxon as *Radiodiscus hubrichti*: both described *Radiodiscus* species differ in numerous ways, and the long-standing placement in different families is also clear. Cited as *Striatura* (*Pseudohyalina*) *pugetensis* in Riedel (1980); Smith et al. (1990); and in Cowie, Evenhuis, & Christensen (1995), following Baker (1941). Pilsbry (1946) places this species in *Striatura* s.s.; on shell features, this is certainly reasonable, as *S. milium*, *S. pugetensis*, and *S. meridionalis* share greenish yellow, opaque shells; narrow, closely spaced non-cuticular riblets or lirae; spiral striae on part or all of nepionic whorls; and central tooth much larger than those lateral, while *S .exigua* has a corneous-greenish shell; completely smooth nepionic whorls; widely spaced riblets with prominent periostracal fringes on the teleoconch whorls; and central tooth about the same size as those lateral. Baker (1928) placed *Helix exigua* Stimpson, 1850 in *Pseudohyalina* Morse, 1864; type *Helix exigua* Stimpson, 1850 by subsequent designation of Kobelt (1880); *Helix milium* Morse, 1859 in *Striatura* s.s. Morse, 1864, type *Helix milium* Morse, 1859 by monotypy; and *Striatura ferrea* Morse, 1864 in *Striaturops* Baker, 1928, type *Striatura ferrea* Morse, 1864 by original designation (*Vitrea milium meridionalis* Pilsbry & Ferriss, 1906 and *Patulasta* (*Punctum?*) *pugetensis* Dall, 1895 not being dealt with); noting that "to be perfectly consistent, the great divergence in their genitalia, radulae, and shells would require three monotypic genera! (op. cit., p. 33). Pilsbry (1946) retained *exigua* in *Pseudohyalina*; *milium* in *Striatura s.s.*; and *ferrea* in *Striaturops*, while placing both *pugetensis* and *meridionalis* in *Striatura*. While there is some confusion in Pilsbry's (1946) key, regarding the anatomical and shell characters used to separate the subgenera (notably, point of origination of striation on the early whorls and presence or absence of rows of spiny processes near the penial apex), it is nonetheless clear that both Baker and Pilsbry intended *milium* and similar taxa to be species of *Striatura* and *exigua* to be *Pseudohyalina*. Baker (1928) recognized two major divisions in *Striatura s.l.*; one with well-developed epiphallus and penis, the second with both vestigial (*Striaturops*). Within the first group, he separated species with penial spines near the apex; central about the same size as the adjoining lateral (*Pseudohyalina*); and species with apical dart-sac, papilla, and dart; central much larger than the adjacent lateral; and shell with rounded riblets along convex growth lines (*Striatura s.s.*). Note the lack of consistent, parallel usage of shell and anatomical features in each definition. In later treatments, Baker (1930, 1933) placed both *pugetensis* and *meridionalis* in *Pseudohyalina*, stating (1930, p. 37) that both "are more closely related to *S. exigua*, either on conchological or anatomical grounds, than to *Striatura* (*s.s.*) *milium*." Examination of specimens of all four lead us to reject the former contention out of hand, the case for close resemblance to *milium* being particularly strong for *pugetensis*. On the other hand, Baker (1930) does demonstrate that *S. pugetensis* has terminal penial processes. Pending detailed anatomical or biochemical re-examination of the involved taxa, we prefer Pilsbry's classification.

Ecology: This is a common litter species, found in a variety of forest plant communities, generally with fairly complete canopy closure. The species seems at home over a wide range of elevations; but tends to avoid high elevations, alpine communities, and unusually dry or open locales. We very rarely encounter this taxon in rock piles or talus. Most sites have moderate to high mollusk diversity, including equal numbers of small and large taxa.

Branson (1977) under the name *Radiodiscus hubrichti* and Branson (1980) under *Striatura pugetensis* note this species from 24 Washington sites. Only 3 Oregon sites were collected by Branson & Branson (1984); but this taxon is common and widespread in the Oregonian portion of that state also. For comparison, our 38-site western Washington 1996 sampling indicated this taxon to rank 8th out of 46, with occurrence at 23 localities.

General Distribution: Common in the Oregonian area from southern British Columbia to its terminus; found also in the Klamath Province and south in the Californian, to lower California (Smith et al., 1990); occurs also in the Washingtonian Province, east to northwestern Montana. It has also been reported from the Hawaiian Islands (for most complete citations, see Cowie, Evenhuis, & Christensen, 1995).

Idaho distribution: No definite sites as yet, despite old reports. However, this taxon has been found in adjacent northern Washington.

Status: While, like all common native Pacific Northwest land snails, this taxon has lost much of its likely original range, a large number of small colonies still exist across its range (at least in Washington and Oregon), so that no special status is needed. Such might be appropriate for Idaho sites, if any.

Vallonia cyclophorella Sterki, 1892
silky vallonia

Discussion: Shell very low conoid, almost flat, with moderately impressed suture; initial whorls smooth; later whorls with closely-spaced finely membranous transverse ribs (ca. 60 on last whorl); shell diameter 2.6-3 mm in adults (3-3 1/2 whorls); shell thin, color lacking or grayish-horn; appearing almost silky to naked eye; peristome nearly circular; slightly everted but lacking distinct lip; strongly oblique but not deflected; umbilicus broad, shallow, nearly circular; contained in full diameter 2.6-3 times.

The fine ribbing is distinctive. This taxon, especially when weathered, can resemble *V. gracilicosta*, but the latter lacks membranous ribs (those present being low but distinct and slightly separated by equal interspaces) and has a distinct, though narrow, flattened lip, rather than a simple everted edge. *V. cyclophorella* is also usually a little larger. *V. albula* is similar in size and rib morphology; but generally has a distinct, thickened apertural lip. *V. perspectiva* is also similar; but generally distinctly smaller (2.0 mm diameter).

Ecology: This species is a hardy taxon, being found in dry rockpiles, *Artemisia* scrub, occasionally in Ponderosa pine forest, and open, shrubby areas with no tree canopy; and in grasslands. It need not be associated with seeps or springs; but can also tolerate considerable moisture. Strictly Nearctic and not known to have been introduced elsewhere.

General Distribution: *V. cyclophorella* seems especially characteristic of the Washingtonian and Rocky Mountain provinces. It also occurs in the Southwestern, here being "more boreal" that is, confined to northern Arizona counties and southern mountains at some elevation (Bequaert & Miller, 1973). It also occurs native sporadically in the Californian (Roth, 1997), being found both in southern California and in the extreme northeastern, Great Basin region. Farther north, it is mostly confined to the areas east of the Cascades crest, but occasionally crosses over slightly into the Oregonian.

Oregon Cascades sites noted by Branson & Branson (1984) were on the east side, in Lake and Klamath counties. We have found it in similar situations in the same areas. Branson (1977) reported a single site from the east side of the Olympic Peninsula: we have not found this taxon in western Washington. Branson (1980) found no Washington Cascades sites, east or west, making the Olympic Peninsula record even more remarkable. The taxon does occur rather commonly in eastern Washington. In the lower Salmon River valley, we found it at 14 of 213 sites, ranking it 13th out of a 60-taxon total (Frest & Johannes, 1995b).

Idaho Distribution: Noted so far at a number of sites in the central and southern parts of the State, including both Washingtonian and Rocky Mountain sites. Often in quite dry terrain, as along the Snake River Plain; sometimes seen in drift piles or flood debris.

Status: This species is still widespread in some of its original range, making special consideration unneeded as yet generally. In Idaho. it seems to be relatively widespread, if not common.

Vertigo (*Vertigo*) *concinnula* Cockerell, 1897
mitered vertigo

Discussion: The mitered vertigo is a significant regional endemic, particular to portions of the Washingtonian, Southwestern, and Rocky Mountain Province. This species is associated with springs and seeps in drier areas and does not seem to be a forest species. Most *Vertigo* species are mesophiles or notophiles; some, like this one, can

tolerate comparatively dry and open habitats if sufficient moisture is available. Although there are a number of springs in the survey area, we did not find it at most; however, the 2 known occurrences (Appendix C59) in the Rock Creek drainage are rather typical occurrences. Other Idaho sites include locations associated with springs in the greater Wasatch Range region of southeastern Idaho (mostly Bear R. drainage).

We have collected this species at a scattering of sites across its old range. While most formerly favorable habitat has been lost, due to a combination of grazing, spring modification or diversion for agricultural and stock usage, and other human activities, it seems unlikely that this species is currently in any danger of extinction. Locally, however, it seems very rare; both known sites have been impacted by road construction and grazing; and local extirpation is quite possible.

Vertigo (*Vertigo*) *modesta modesta* Say, 1824
cross vertigo

Discussion: Shell cylindrical, often cinnamon colored; glossy; rather weakly striate, with striation most distinct on the middle whorls; whorls narrow, strongly convex; adults typically about 5 1/2, with length ca. 2.4-2.6 mm; aperture only slightly expanded; no sinulus; weak crest visible in side view; no depressions over palatals; four lamellae typically, slightly inset from apertural lip; all short, rather peg-like; parietal, central columellar, and upper and lower palatals arranged to form a cross (columellar opposite upper palatal; parietal opposite lower palatal); lamellae generally not deeply immersed; no palatal callus.

This species is often regarded as quite variable *e.g.*, Pilsbry, 1948), although populations in our experience show relatively little variation in adult specimens. For example, the senior author once examined 5,000 adults from a single Iowa loess site without noting any variation in lamellar number. Some specimens show a vestigial to weakly developed angular. Many of the forms with reduced lamellae likely represent separate taxa, *e.g. V. genesii*. Note that the European usage of this name is somewhat different, *i.e.* "shell pale yellowish-brown, translucent, not glossy, usually with a silky sheen due to numerous regular fine growth-lines"; "mouth usually with 3-4 rather deeply-set small denticles; 1 parietal, 1 columellar, 1 lower palatal (the last sometimes absent, sometimes an additional upper palatal" (Kearney & Cameron, 1979). The *modesta* species group needs careful revision, as noted also by Branson (1977); and here may be a reverse case of the early tendency in malacology to ascribe US specimens to European taxa, *e.g. Columella edentula* and *Euconulus fulvus*.

Ecology: Widely distributed in moist habitats in the northern portion of North America, including Alaska. In the more southerly occurrences, most likely to be confined to higher elevation sites such as open mountain meadows; but also found at lower elevations around seeps, bogs, or fens.

General Distribution: This taxon is quite widespread in the Northern Province; and in the Western Division in the Rocky Mountain and Washingtonian provinces. Its distribution in the Oregonian is more sporadic, as by southern British Columbia it appears that the taxon is largely confined to higher elevation sites, *i.e.*, along the main Cascades axis; or to bogs and fens regardless of elevation.

Branson (1977) noted three sites in the Olympics; Branson (1980) one Washington west Cascade site. Pilsbry (1948) noted no occurrences of the typical form in Washington, Oregon, or California. Note that our 1996 western Washington sampling of 38 sites yielded only 3 occurrences, ranking the taxon 26-29th of 46.

Idaho distribution: So far, no recent sites; but quite possible. Definitely present in adjacent parts of Washington, and in western Wyoming quite close to the Idaho border.

Status: No special status required for much of the continent; but western Washington occurrences are few and scattered. The status of eastern Washington and Oregon occurrences needs to be reassessed, given that there are California endemics related to this taxon. Any Idaho occurrences would likewise be limited in area and extent, and likely in very restricted habitat. Rocky Mountain occurrences are perhaps most likely.

Vertigo (*Vertigo*) *ovata ovata* Say, 1832
ovate vertigo

Discussion: This species has a robust ovate, auburn-colored. glossy shell; the spire is strongly convexly conic, with very obtuse apex; whorls appearing to be few (but up to five at 2.2-2.6 mm height); rapidly increasing, with ultimate making up as much as 1/2 total height; aperture with well-reflected lip, especially along columella; outer lip sinulus prominent; crest also prominent; thin raised callus inside, joining palatals; depressions over each palatal externally. Lamellae varying from 6 to 9; most often, a moderately strong oblique parietal; a small oblique angular; a prominent, high-placed, flattened columellar; small basal; and two prominent, oblique, subequal palatals; sometimes a very small infraparietal; one or two infrapalatals; and, fairly commonly, a small suprapalatal.

California specimens have generally been segregated as *V. ovata mariposa* Pilsbry, 1919; this taxon is currently not accepted by Roth (1997).

Ecology: In the western states, this species seems to be found mostly along edges of floodplains and on sedges and grasses in spring meadows or along smaller permanent streams, mostly at relatively low elevations.

General Distribution: Pilsbry (1948) terms this aptly "the most widely distributed" US *Vertigo*. This taxon occurs rather more spottily, however, in the western US than in the eastern or northern. Pacific NW sites are quite sparse, although the species is reported throughout the length of the Oregonian Province. In his work, Pilsbry (1948) was unaware of sites with the typical morphology from Wyoming, California, and Nevada. California localities were assigned to *V. ovata mariposa* or the related *V. berryi*. Note that Roth (1997) accepts both *V. berryi* and *V. ovata* (as the typical form) from scattered California sites. Alaskan sites are well-accepted. Pilmore (1989) notes sites from four Wyoming counties.

Branson (1977, 1980) and Branson & Branson (1984) failed to note sites from western Washington or Oregon and did not mention this taxon. It is of rare occurrence in both states in the habitats mentioned above. Note that our 1996 38-site western Washington lists did not include this species.

Idaho distribution: So far, we have seen this taxon from a single site in eastern Jackson County, Oregon. A single site is also known from adjacent Klamath County, on the eastern side of the Cascades. Other sites are known from north central Washington; hence occurrence in northern Idaho, at least, is probable.

Status: No special status is necessary over most of North America. However, western US sites are rare generally, except perhaps in the southwest Province, and Oregonian and Klamath sites seem on present information to need some protection if regional extirpation of this species is to be prevented. Idaho sites might fit into this same category.

Vitrina pellucida (Müller, 1774)
western glass-snail

Discussion: Shell thin, transparent, shining greenish; 3 whorls at 10 mm diameter, slowly expanding, with the final comprising most of the shell; spire greatly depressed; aperture ovate, large, oblique; lip thin, unmodified. The living animal is usually gray; and the mantle lobe does not override the shell to any great extent.

Reported in Pilsbry (1946), Branson (1977, 1980) and Branson & Branson (1984), as *Vitrina alaskana*. Noted under both names in Baxter (1987). This thin-shelled semislug is listed under the European *Vitrina pellucida* (Müller, 1774) in Turgeon *et al.* (1988, 1998).

Ecology: Found in a variety of warm and cold xeric habitats, often at rather open sites, ranging from near coastal to subalpine elevations. Quite frequent in talus and on rocky ground; seldom seen in forested locales; but quite possible in more or less long-lived forest openings or meadows. Rather cosmopolitan in western North America, this taxon has been reported from a variety of habitats, ranging from muskeg and near-tundra situations to fairly xeric habitats. No easy characterization of associates is possible. Locally, most sites are quite open and xeric, with rock (especially basalt) talus being especially common; and vegetation ranging from nearly none to grasses and

sage scrub. It also occurs locally on rather moist, north-facing slopes in partly open Ponderosa pine forests.

Pilsbry (1946) reports adult animals from August to October; but in our experience most adults are more likely to be encountered in the NW in October to December. The western glass-snail is usually seen in small numbers at particular sites. Its life history is unusual, with activity sometimes continuing into winter. We see most young specimens in early spring. Often associated locally with such small species as *Pristiloma chersinella*, *Vertigo modesta*, *Vallonia cyclophorella*, and *Punctum randolphi*.

General Distribution: Quite widespread in nearly all of the western Division provinces; but tending in the Californian and in the Southwestern to be confined to higher elevations. This taxon seems particularly widespread in the Washingtonian and Rocky Mountain provinces. Noted definitely in Alaska from the North Gulf Coast and Aleutian Islands

Branson (1977) found it at 6 high elevation sites in the Olympic Mountains; Branson (1980) noted it at high and low elevation sites on both sides of the Washington Cascades. Branson & Branson (1984) found it at 4 sites on the east side of the Oregon Cascades, but not the west. Of the 38 sites in a western Washington sampling conducted in 1996, we noted it at only one site, ranking it in the 35-46/46 range. Most of our sites were forested.

Idaho distribution: This is not a common species in much of the more forested part of the State; but quite likely to be encountered in the more dry and open portions, such as the areas around Hells Canyon and the lower Salmon River, where it is often found in basalt talus. In the well-studied lower Salmon River corridor, it is locally common; the 17 occurrences noted (Tables 3,4) are widely distributed through the survey area, with nearly all, however, at sites along the mainstem Salmon River (Appendix C60).

Status: This species seems to be well distributed and hardy and is relatively secure throughout its range, as far as we are aware. It requires no special status except perhaps locally; but further work here would be required; it may be quite widespread in habitats as yet inadequately sampled.

Zonitoides arboreus (Say, 1816)
quick gloss

Discussion: Shell with very low spire; glossy; translucent olive buff; umbilicate, with umbilicus contained about 4.5-5 times in the diameter; adult diameter about 5.5-6.0 mm at 4 1/2 whorls; whorl evenly convex, evenly increasing; nepionic whorls smooth; teleoconch with rather faint and irregular growth lines and nearly obsolete spiral striae; the base smoother yet; aperture lunate; peristome thin, unmodified; animal usually light gray.

This taxon is not readily confused with any other native NW species. *Z. nitidus* is larger; has a proportionately smaller umbilicus; a slightly higher spire; and a more circular umbilicus; the animal is bluish black, as contrasted to the light gray of *Z. arboreus*.

Ecology: In the western US, this widespread taxon occurs very sporadically in three separate habitats: 1) at relatively high elevations, often in more open situations, above timberline, or around edges of swamps, fens, and seeps; 2) along floodplains of lowland streams, often near the outside edge of the floodplain only. On rare occasions, found in rock piles or talus; 3) in rather xeric situations in grassland or scrub, often among rocks or along open stream floodplains. The quick gloss has thus been recorded from a variety of habitats. In the western states, it is something of a synanthromorph but also found in open woods, along floodplains, and in swampy areas or near springs.

General Distribution: Perhaps the most widespread single land snail species on the continent. See Hubricht (1985, p. 137, map 321) for US distribution. Note, however, that occurrences in the western US are quite sporadic. This reflects a real situation in some cases, not collection gaps. Moreover, at least (but not all) some western US sites appear to represent introductions. Some such sites are back yards, debris piles near ports, arboretums, and the like. The species is sporadic throughout the Oregonian Province, perhaps more common in Alaska and British Columbia than farther south. Occurrences in the Washingtonian Province are also seemingly

more common. This species tends not to be found in mature NW forests, but rather in more open or modified areas.

Branson (1977) noted this taxon from 12 sites; Branson (1980) from 8 sites on both sides of the Oregon Cascades; Branson & Branson (1984) from two Oregon sites. To give an idea of occurrence in more forested sites, note that in our 1996 western Washington sample, this taxon appeared at only a single site of 38, ranking it 35-46 of 46 species.

Idaho distribution: *Zonitoides arboreus* seems to be very rare in the lower Salmon River area. It was noted at a single site, a spring on a north-facing slope, east of Riggins (Frest & Johannes, 1995, Appendix C62). So far, this species has been collected by us in southern Idaho, on the Snake River Plain and in southeastern Idaho (Bear River drainage), although both introduced and native occurrence is likely.

Status: This species is probably one of the most secure native land snail taxa in the United States. Its rarity in this state is surprising, particularly its absence from litter samples. Not in need of any special status, except perhaps locally. The likelihood that some western sites represent introductions makes it difficult to evaluate the range and significance of this species locally.

INTRODUCED SPECIES

SHELLED SNAILS

Oxychilus (*Orizius*) *allarius* (Miller, 1822)
garlic glass snail

Discussion: Shell depressed , adults 5.5-7 mm with 4-4 1/2 whorls; spire slightly raised; whorls evenly expanding; umbilicus rather broad and excentric, about 1/5-1/6 full shell diameter; shell glossy, translucent, usually pale yellowish-brown or greenish; suture impressed slightly; animal dark bluish-gray, smells strongly of garlic if disturbed.

Smaller than *cellarius* and *draparnauldi*; last whorl does not enlarge, as in *draparnauldi*; the essentially black animal distinguishes it from *cellarius*; the garlic odor is also unusual for the genus.

Ecology: Kearney & Cameron (1979) state that this species is more or less catholic, being found in woods, fields, and rocks; and also in rather acidic plant communities, not to mention gardens and greenhouses.

General Distribution: Native primarily to western and central Europe. Several eastern US and Canadian sites are mentioned in Dundee (1974)(Michigan, New Jersey, New York, Rhode Island, Ontario). Most US occurrences reported by Pilsbry (1946) are in greenhouses; but rock garden sites are not uncommon in Washington and doubtless elsewhere. Reported early from California (1891). Hanna (1966) and references therein record several sites, although the possibility of confusion with *cellarius* or *draparnauldi* should be kept in mind: Capizzi (1963a): Polk County, Oregon; Capizzi (1963b): Portland, Oregon greenhouses are possible sites. One Olympic Peninsula site reported in Branson (1977); not noted in Branson (1980) or Branson & Branson (1984). Roth & Pearce (1984) report the taxon from Lynnwood, King County, Washington. We did not note this taxon from our western Washington 1996, 38-site sample, mostly more or less "wild" sites or recent clear-cuts. The species is relatively common in older Seattle neighborhoods.

Idaho distribution: Probably comparatively widespread in cities and towns. No colonies in strongly natural settings have yet been noted in this area. *Oxychilus* has been noted at several Coeur d'Alene corridor sites. Occurrence in larger southern cities is probable.

Status: A definite adventive; no special status appropriate.

Oxychilus (*Oxychilus*) *cellarius* (Müller, 1774)
cellar glass snail

Discussion: Shell adult at 9-14 mm, 5 1/2-6 whorls; whorls gradually and regularly increasing; shell shiny, pale, and translucent; shell color none to light brown or corneous; shell with faint growth lines and rather faint microscopic spiral striae; body color usually pale bluish-gray; umbilicus symmetrical, small, contained in the diameter about 7.5 times; spire strongly depressed; very low conoid; suture relatively conspicuous, although appearing channeled; aperture thin, lunate, height and width subequal.

O. allarius is smaller; the body has a distinct garlic odor; the body is dark gray to black; the spire distinctly higher; and the umbilicus slightly wider proportionately. *O. draparnauldi* is larger; the last whorl is distinctly broader than the preceding whorls; the aperture is oblique, with width exceeding height; the animal is nearly black (dark cobalt blue); lacks a garlic odor; the shell is pale brownish-yellow and not strikingly glossy; growth-lines are well-developed, although irregular, especially on the last whorl; and the suture is not well impressed.

Ecology: In Europe, this taxon is a frequent inhabitant of cellars and moist shaded habitats of all kinds, including caves, woods, rock piles, rubbish piles, and gardens (Kearney & Cameron, 1979). In the US, the species is distinctly synanthropic, found mostly in gardens, parks, and greenhouses. Back yard debris piles and front yard rock gardens are favorite habitats in Seattle.

General Distribution: Native primarily to western and central Europe (Kearney & Cameron, 1979; Kearney, Cameron, & Jungbluth, 1983). In the US, this species has been known as an introduction for over a century. For western US occurrences, see Pilsbry (1946). Hanna (1966) and references therein record several sites, although the possibility of confusion with *cellarius* or *draparnauldi* should be kept in mind: Capizzi (1963a): Polk County, Oregon; Capizzi (1963b): Portland, Oregon greenhouses. Not noted in Branson (1977, 1980) or Branson & Branson (1984).

Idaho distribution: Probably comparatively widespread in cities and towns. No colonies in strongly natural settings have yet been noted in this area. *Oxychilus* has been noted at several Coeur d'Alene corridor sites. Occurrence in larger southern cities is probable.

Status: Non-native taxon; no special protection appropriate.

Oxychilus (*Oxychilus*) *draparnauldi* (Beck, 1837)
dark-bodied glass snail

Discussion: This is a rather large *Oxychilus*. Shell of adults 11-16 mm with 5 1/2-6 whorls; last whorl distinctly broader than preceding; shell looking slightly compressed in side view; spire quite low; aperture slightly elongate lunate, width greater than height; umbilicus narrow. contained about 8 times in full width; shallow; shell color pale brownish yellow, not very glossy; somewhat opaque; body dark cobalt blue.

This species is comparatively large and lacks the garlic odor of the much-smaller *allarius*. the rapid expansion of the last whorl is quite different than the even expansion rate displayed by *cellarius*; and the compressed profile and oblique last whorl are also distinctive.

Ecology: According to Kearney, Cameron, & Jungbluth (1983), prefers moist sheltered places and woods among rocks; but common to gardens and greenhouses also; said also to be markedly carnivorous. In the US, mostly noted from greenhouses (*e.g.*, Chichester & Getz, 1973; Dundee, 1974); but feral colonies known as well, *e.g.* Frest (1981) records an Iowa introduction, likely from greenhouse discards, that has gone feral.

General Distribution: Native to the western Mediterranean and to western Europe generally (Kearney & Cameron, 1979). For US sites, including ones from California, Portland, Oregon, and Seattle, Washington, see Pilsbry (1946) and Dundee (1974). A single site (85: a garbage dump) from the Olympic Peninsula, Washington, reported in Branson (1977); none noted in Branson (1980) or Branson & Branson (1984). Sites in older Seattle neighborhoods and city parks are not uncommon.

Idaho distribution: This taxon has been observed in Coeur d'Alene and Boise, Idaho. Undoubtedly present at many unrecorded sites, including ones in southern Idaho. The possibility of confusion with *cellarius* or *draparnauldi* should be kept in mind.

Status: This adventive taxon should not be accorded special status. So far, there is little indication of truly feral status in the western US.

Helix (*Cornu*) *aspersa* Müller, 1774
brown gardensnail

Discussion: Shell large, globose, to 45 mm diameter and 40 mm height; thin, 4 1/2 whorls as adult; yellow ground color, with 0-5 brown bands, generally interrupted; surface commonly malleate; embryonic whorls 1 1/2, smooth; remainder with radial striae, somewhat irregular growth striae, and anastomosing wrinkles; final whorl slightly descending in front; aperture with distinct white lip; umbilicus generally closed by dilated apertural lip at columella.

The only native forms at all similar in this region would be the various species of *Helminthoglypta*. These are generally smaller; but more importantly generally have only a single, near-peripheral tin brown color band.

Ecology: Quite varied even in Europe, according to Kearney & Cameron (1979):

General Distribution: Native to the Mediterranean and western Europe (Kearney, Cameron, & Jungbluth, 1983). Introduced into the western US at an early point, perhaps as early as 1850 (Forbes, 1850). Pilsbry (1939) lists numerous places of introduction, including several in California. For more complete coverage, see Hanna (1966); for eastern US records, see Dundee (1974). Noted from Coquille, Coos County, Oregon by Capizzi (1963a) and from a Portland, Oregon greenhouse (Capizzi, 1963b); from western Washington by Capizzi (1961b) and also from Pacific County, Washington (Anon., 1961c). Hanna (1966) noted that the species was by that time quite widespread in California, even in desert areas, as long as gardens were present. He also noted instances of the taxon seemingly becoming naturalized in beach cliff settings. The Sisters Rocks, Curry County, Oregon site collected during this survey is similar. In 1966, Hanna (op. cit.) was aware of no sites north of the Pacific County, Washington locality. While the species is as yet not nearly as ubiquitous in Oregon, Washington, and southern British Columbia, it is well established in each and spreading. For example, there are at least a dozen separate introductions within one mile of the senior author's own North Seattle residence. So far, the species seems to be largely confined to synanthropic settings, although beach and rocky headland occurrences in Washington and Oregon, as well as California, seem to be thriving in particular, even in fairly natural settings.

Note that no sites are listed by Branson (1977, 1980) or by Branson & Branson (1984). Our 1996 38-site western Washington sample also had no localities with this species, in part because few strongly synanthropic sites were included.

Idaho Distribution: This taxon is widely distributed in urban and suburban areas, even in the relatively arid southern part of the state. So far, sites appear to be strongly synanthropic.

Status: Adventive species; an agricultural and garden pest in many places, such as California. No protection desirable.

Cepaea (*Cepaea*) *nemoralis* (Linnaeus, 1758)
grovesnail

Discussion: Shell slightly depressed, subglobular; maximum adult diameter 28-32 mm with 5 1/2 whorls; spire rather low conoid; whorls convex , evenly expanding; umbilicus covered by apertural lip; apertural lip typically well-developed, dark brown shell glossy, brightly colored; ranging from yellow and orange to white or pink; most often yellow; with 0-5 dark brown spiral bands (often very variable in color and development; Native *Helminthoglypta* generally would have a yellow to yellow-brown ground color and a single, thin brown color band near the shell whorl midpoint. The glossy shell surface is also distinctive.

Introduced colonies in Washington and Oregon tend to retain 2 or more dark brown bands; have the lip normally colored; and tend to have a yellow ground color. Specimens from southern British Columbia are more varied, with orange forms rather more common than reported elsewhere.

Ecology: In Europe, according to Kearney & Cameron (1979), very varied, including woods, hedges, scrub, grassland, and dunes. These same authors note colonies at elevations of 1200 to 1800 m. US colonies tend to be strongly synanthropic, with the species found in rockeries, debris piles, and along railroad tracks, plus occasionally along shore lines. Only these last seem to show tendencies toward naturalization and rapid expansion.

General Distribution: Western Europe generally as a native (Kearney & Cameron, 1979). Introduced into a number of US states. First reported from the US about 1857 (Pilsbry, 1939). Records of introductions into western North America include British Columbia (Draycot, 1961; Spencer, 1961) and California (Hill, 1941). For eastern US records, see Dundee (1974). The species has been noted by us from Seattle, Issaquah, and suburban King County, Washington; and from Corvallis, Oregon. Undoubtedly more widespread than present records indicate. So far, this taxon has been noted only in strongly synanthropic settings locally; generally at relatively low elevations.

Idaho Distribution: Noted in the Kellogg area and quite likely in older cities.

Status: Some time agricultural pest and adventive species: no protection appropriate, even if found in this region.

Vallonia pulchella (Müller, 1774)
lovely vallonia

Discussion: Shell strongly depressed, umbilicate, umbilicus doubling width in last whorl, contained about 4 times in diameter, only slightly excentric; adults 2.2-2.4 mm in diameter at 3 1/2 whorls; whorls, especially last, convex; suture deep but not descending much near aperture; aperture oblique, with broad flat white margin; last whorl expanding only slightly at termination; shell corneous or white, often with milky tint; surface glossy; smooth except for faint growth lines.

The only closely similar taxon is *V. excentrica*, which also has a relatively smooth shell; but that species has a distinctly excentric umbilicus and the last whorl expands considerably near the aperture. The apertural margin is less thickened and narrower in *V. excentrica*, also.

Ecology: Found in a variety of situations in its native range, including lawns; prairies, meadows, grasslands, wet forests, swamp and fen edges; stream edges; roadsides and railroad grades. Western US sites may largely be introductions, so that synanthropic situations are most typical, such as rock gardens or debris piles; greenhouses, etc.

General Distribution: Hubricht (1985) regards this as a Holarctic species. In the eastern and central US, sites are frequent east of the Mississippi and north of the Ohio rivers. The species is also widespread in southern

Ontario (Oughton, 1948). Pilsbry (1948) regarded the western and southern range as hazy. He quotes Junius Henderson's belief that sites in this area are not native. Nevertheless, Pilsbry (op. cit.) noted a number of western sites specifically, including ones in the Oregonian, Washingtonian, and Rocky Mountain provinces. Essentially all of these appear to be introductions. Roth (1997) so regards California sites; for descriptions of some of these, see Hanna (1966). Southwestern Province sites are treated similarly by Bequaert & Miller (1973).

This taxon is widely distributed in western and central Europe (Kearney & Cameron, 1978). These same authors note a similar distribution for *V. excentrica*.

Pilsbry (1948) noted sites from Phoenix (just southeast of Medford), Jackson County and from two miles above (presumably, southeast of) Milton, Umatilla County, Oregon. No Oregon or Washington occurrences are mentioned by Branson (1977, 1980) or Branson & Branson (1984). Our western Washington 38-site sample did not have this species, though most were relatively natural sites or recent clear-cuts, hence not likely to in any case.

Idaho Distribution: So far, noted from just one site in the Snake River Plain, where it may have been introduced. With detailed search, this taxon has the potential to be found in all counties, though mostly as a synanthromorph. As yet, there are no reports of feral colonies in the western states.

Status: This introduced taxon requires no special status. It does not appear to be an agricultural pest, although Hanna (1966) notes instances of damage to dichondra lawns (see also Anon, 1960, 1963a, 1963b); and so far has not gone feral in this area.

Zonitoides nitidus (Müller, 1774)
black gloss

Discussion: This species is similar to *Z. arboreus* but is larger; has a proportionately smaller umbilicus; and has a more rounded aperture. Shell olivaceous yellow; very glossy; umbilicate, with umbilicus contained 5 times in diameter; whorls about 4 1/2 at 6-7 mm diameter; convex; evenly enlarging; suture well impressed; nepionic whorls smooth; sculpture of teleoconch consists only of weak, irregular growth wrinkles; aperture roundly lunate; body almost black.

Ecology: Not as ubiquitous as *Z. arboreus*; in the eastern US, found especially in very moist areas. Hubricht (1985) terms this a species of low ground, found on logs and litter in floodplains, marshes, and wet roadsides. A Holarctic taxon. Ecology in the western US uncertain; noted in greenhouses as an introduction.

General Distribution: For eastern US distribution, see Hubricht (1985). Reported sporadically as native from the western US, with coastal reports especially dubious. Pilsbry (1946) notes occurrences from a greenhouse in Seattle, Washington; around Astoria, Oregon; reported also from several sites in California (San Diego, Berkeley, Los Angeles County). The California reports are discounted by Roth (1997). We have not seen native sites; nor backyard introductions as yet in Washington or Oregon, although these are possible. Branson & Branson (1984) apparently accept the Astoria site as native, rather than feral or adventive; and record a single site from the eastern Cascades in Oregon. This site, on Spence Mountain, Klamath County, in dry pine forest, is quite implausible in terms of both geography and ecology, in our opinion. Large specimens of *Nesovitrea binneyana occidentalis* are known from the same area.

Idaho distribution: Not reported either native or introduced from this area as yet, although quite possible, especially in the north. Occurrence in larger southern cities is probable.

Status: No special status required, even for the survey area, as doubtfully native.

SLUGS

NATIVE TAXA

Ariolimax (*Ariolimax*) *columbianus* columbianus (Gould, 1851)
Pacific bananaslug

Discussion: Slug large, often 20-25 cm in length when extended; generally olive greenish or brownish-green, with or without black maculations or splotches; more rarely greenish-brown, grayish-green, or white; toward the southern edge of the range, yellowish-green, grading into the yellow typical of the other subspecies, *A. columbianus stramineus*. Often quite variable in color within the same colony. We have mostly seen the white or pale forms as small colonies, sometimes consistent, in northern Washington. In the Oregon Caves National Monument, there is a brownish-yellow form with a bright yellow dorsal streak: this form needs further investigation. Most specimens do not have a differentiated dorsal streak.

This is the large, typical Douglas fir forest slug of the Pacific Northwest. It is one of the few slug species worldwide to have a book-length popular treatment (Harper, 1988).

Ecology: Found mostly in moist forest, often with some canopy closure; but less often in grasslands, on beaches, in talus, or on rocky outcrops. This taxon is found at a variety of elevations and in most of the major Oregonian plant communities; but tends to avoid high elevations, *i.e.*, alpine and subalpine environments. It is most characteristic of mature forests and frequently absent from recent clearcuts. Only occasionally is it noted from synanthropic contexts, such as backyards, in some instances of which it has probably been transported. On the other hand, rural domiciles in at least partly forested settings may well have it. The species tends to avoid the most dry forest situations as well.

General Distribution: The nominate form is particularly characteristic of the Oregonian Province, from southern Alaska, including some of the Aleutian Islands, south to southern Oregon, most particularly on the west side of the Cascades to the Coast, although crossing the Cascades crest locally in some areas. This form occurs also throughout the Klamath Province, down to San Francisco Bay. For an excellent distribution map, see Harper (1988) . Noted by Branson (1977) at 57 Olympic Peninsula sites; Branson (1980) records it from 13 Washington Cascades localities; Branson & Branson (1984) note 36 western Oregon sites. Our 1996 western Washington site sample ranked this taxon first of a total mollusk diversity of 46, it being present at 34 of 38 sites.

Idaho Distribution: Fairly common in mature forest in northern Idaho .

Status: This slug is now much less common through most of its range than formerly; but still well-distributed in small colonies essentially throughout the northern third of the state. No special status is required.

Prophysaon (*Prophysaon*) *andersoni* (Cooper, 1872)
reticulate taildropper

Discussion: Slug medium-large, 3 to 6 cm when extended; body color reddish-gray, with some scattered black pigmentation (usually less on mantle); dark, generally continuous, longitudinal band on each side of mantle; distinct reddish dorsal streak on tail; reticulations numerous but coarser than in *P. foliolatum*; outlined in dark pigment; abscission zone moderately distinct, making up 20-30% of the body length (proportionately shorted than in *P. foliolatum*); sole light gray; mucus opaque yellow.

This is a complicated and variable species. We have used this term for the common medium-sized *Prophysaon* with reddish-fawn ground color and yellow mucus, which ranges from extreme southwestern Alaska to the San Francisco Bay area, California. From Corvallis, Oregon south into California there is a common variant with yellow bordering the foot and a largely dark, bluish-black groundcolor. This form when mature is often 5-7 cm in extended length; lacks any reddish pigment; and slightly finer reticulations (but not so much as in typical *P.*

foliolatum). We have noted this form in pure colonies in Benton, Lane, Douglas, Jackson, Coos, Josephine, and Curry counties. In the area of its occurrence, it is generally more common than the reddish form. So far, it does not seem to occur strictly sympatrically with the reddish variant; and we have not seen it north of Benton County, Oregon. Roth (1999, pers. comm.) informs us that this may be the common form currently at Oakland, the type locality of *andersoni*, and elsewhere in the Bay area. Pilsbry's (1948) descriptions of anatomy were based upon preserved Oakland specimens. As such material rather quickly tends to depigmentize, one may well wonder which form was used. Currently, we use the name *Prophysaon* n. sp. 3 (q.v.) for the dark form from southwestern Oregon and northwestern California, in keeping with Cooper's (1872) external description. But it is possible that Oakland material of the dark form is true *andersoni*.

This is a variable taxon in terms of color, with melanistic and albino individuals not infrequent in large populations. In some areas, the most commonly observed from is a smaller (3-5 cm) slug with brownish upper body ground color and yellowish dorsal streak and foot borders; but other morphology as described above. Dissections of Washington specimens of this form indicate an *andersoni*-like anatomy. In at least one large population observed repeatedly over three years, there appears to be a regular seasonal replacement of the reddish forms by the brownish forms with yellow borders. In other areas, such as the Columbia Gorge, the reddish form appears to be rare to absent and the brownish form is prevalent at all seasons.

This taxon somewhat resembles another very variable species, *P. foliolatum*. This slug, however, is larger (7-10 cm length); has finer reticulations that are also not as strongly pigmented; has a very narrow dorsal streak and has a longer abscission zone, constituting 30-40% of total body length. When fully extended, the head of *P. foliolatum* does not extend as far as the mantle's length in front of the mantle and appears blunt; the head of *P. andersoni* extends a mantle's length forward of the mantle proper and appears much more acuminate. The mantle of *P. foliolatum* often has the longitidinal color bars broken up and fainter, so that much of the mantle is colored like a ripe banana. Almost always, the mantle longitudinal edges are bright yellow and there is a larger yellow pigment dot along the posterior mantle edge, where it contacts the dorsal streak, in this species. *P. andersoni* of the reddish form typically lacks these mantle features. The brownish form of *P. andersoni* and the dark form (*P.* n. sp. 3) may also have yellow-bordered mantles, although the border is often very narrow and the posterior spot often absent. Note that xanthic (often yellow pigment only) and melanistic (almost black) individuals of *P. foliolatum* are not very rare. Also, there are two common color forms (or species?) currently subsumed in *P. foliolatum*. One has the groundcolor above reddish to reddish-gray, much as in *P. andersoni*. The second has yellow to yellowish-gray ground color (lacks red pigment entirely). Both are found as pure colonies and both may have xanthic or melanistic individuals constituting a small part of the population. We are not yet certain of the range limits of the two forms. The red form is known to extend from southern British Columbia south in the Cascades and along the Coast and Olympic Peninsula to Tillamook, Washington, and Multnomah counties, northwestern Oregon. The yellow from extends from southwestern Washington (Willapa Hills) to northwestern Oregon. Note the apparent absence of typical *foliolatum* from southwestern Oregon.

Ecology: Found generally in relatively mature, moist forest, often with some deciduous tree or shrub component; and often at slope base, or along borders of floodplains; sometimes seen in more open but very moist situations, such as stream borders.

General Distribution: Most of the Oregonian and Klamath provinces. Reports from the Washingtonian areas, except possibly Oregonian border sites, *e.g.* Idaho (Pilsbry, 1948) may be mistaken. The dark form has a distribution approximately from Corvallis (Benson County), south in both the Coast Range and western Cascades (and Willamette Valley) into southwestern Oregon. We are currently uncertain of the southern range limits in California. Noted from all counties in the survey area, but more common in Douglas, Coos, Curry, and northern Jackson counties

Idaho Distribution: See above. Possibly reliably reported from the Weiser area and other areas in central western Idaho; but we have not seen it there. Most old records actually refer to P. humile.

Status: This taxon is the most widely distributed of the *Prophysaon* species. So far, there appear to be enough relatively secure populations that special protection does not seem to be warranted. Of all the native slug species, this appears to be the only one reported to have been an agricultural pest; and there is only a single report (Johanson & Brannon, 1955, 1956). Idaho occurrences, if any, would be rare and areally very limited.

Deroceras (*Deroceras*) *laeve* (Müller, 1774)
meadow slug

Discussion: Slug small, extended length 1.5-2.5 cm; groundcolor chestnut to very dark brown, generally with darker flecks; mantle often lighter in color; fewer and larger concentric rings fingerprint pattern) than other species; rim of respiratory pore slightly paler than mantle; posterior keel short, truncates rather abruptly; sole pale brown; mucus watery, colorless.

This slug is smaller and darker than *D. reticulatum*; and the slime is clear and thin. *D. caruanae* (=*D. panomitanum*) is generally larger and the respiratory pore margin is distinctly paler than the rest of the mantle. *D. monentolophus* is very difficult to distinguish from this taxon, as it is the same size and the coloration is very similar. *D. monentolophus,* however, has a more heavily speckled mantle and the area surrounding the respiratory pore (pneumostome) is also pigmented. The two are best differentiated on anatomical characters: see Pilsbry (1948) for full discussion.

This taxon is known to have been native to the US prior to European settlement, as indicated by finds of fossils in Mid-continent loess deposits (often Late Wisconsinan: Woodfordian) of Nebraska, Kansas, Iowa, Illinois, Wisconsin, Missouri, Indiana, Arkansas, and Louisiana. Bequaert & Miller (1973) regard the fossil record of this taxon in North America as Pliocene-sub-Recent; this includes the supposed fossil taxon *D. aenigma* Leonard, accepted as valid by Hubricht (1985). Note that Bequaert & Miller (1973) regarded as native occurrences in Arizona at elevations of 4,500-8,000 ft. and as adventive most or all sites in cultivated areas, generally at lower elevations.

There is a possibility of additional cryptic taxa in *Deroceras* in the western US. The classic examples are *D. monentolophus*, *D. hesperium*, and *D. heterura*. In some relatively natural, high areas in the NW, black or bluish-gray *Deroceras* may exist in pure colonies; these forms require further study.

Ecology: This is a very common slug of grasslands, wet areas, and open spaces of all kinds. This taxon seems less dependent upon very persistent moisture than is *D. reticulatum*, although the two are quite often found at the same sites. Found quite abundantly in synanthropic settings of all sorts; but also completely naturalized. Less common in forests than along floodplains. May occur essentially to treeline or even above.

General Distribution: Holarctic; essentially circumboreal (Bequaert & Miller, 1973). The situation is complicated in the US, as elsewhere, by the likelihood that an original native distribution is overlain by repeated introductions of European stock. Likely native from the Arctic Circle to Central America (Pilsbry, 1948; Bequaert & Miller, 1973). Roth (1997) accepts native occurrence in California. Branson (1977) records 14 Washington Olympic Peninsula localities. Branson (1980) found it at 2 Washington Cascades sites. Oddly, Branson & Branson (1984) noted it in Oregon only from Klamath County; we have found it quite common in all of the coastal Oregon counties and throughout the Willamette Valley region.

Idaho Distribution: Quite common in most counties, particularly in synanthropic settings; but also in moist habitats generally, at a range of elevations, including isolated springs. Usually not noted in mature NW forests, a finding that echoes Hubricht (1985, p. 22) "I have never found it in deep woods".

Status: Essentially ubiquitous adventive, except in very dry areas; no protection is appropriate for a variety of reasons.

INTRODUCED TAXA

Arion (*Arion*) *ater* (Linnaeus, 1758)

black arion

Discussion: Slug large, often 10-15 cm long when extended; rarely up to 20 cm in length. Body color often coal black; more rarely gray to brownish black; fringe along sides of foot similarly colored. The large size of this and the following species are unusual among NW species. Only the Pacific bananaslug is equal or greater in length. The bananaslug, as noted above, is never black (usually greenish or yellow) and lacks the reddish fringe of *Arion ater*. Both this taxon and *Arion rufus* are more frequently found in human-modified settings, although both are becoming naturalized.

We follow some current European and US (*e.g.*, Turgeon *et al.*, 1998) practice in regarding this as a full species. *A. ater* in Washington, Oregon, and British Columbia is generally coal black, making it easily distinguishable from *A. rufus*. Additionally US specimens dissected so far seem never to have a reddish fringe, regardless of the color of the rest of the body. Even when unusual color forms are present, it may be distinguished by its coarser reticulations, thinner, but more viscous and shiny mucus, and rocking behavior when disturbed. This is a tendency, when disturbed in the open, to pull in both the anterior and posterior-most parts of the body, producing a large, elliptical profile which is wider than the slug in motion. The slug may remain in such a position for several to many minutes, often intermittently slowly rocking the body in a lengthwise direction whether or not further disturbed. *A. rufus* does not remain long in an exposed contracted position and does not display the rocking behavior.

Ecology: Found commonly in synanthropic settings, such as back yard rubbish piles, rock gardens, and lawns; but also found commonly along roadsides or railroad grades through even mature native forest and in recent clearcuts. Found also in relatively mature second-growth. It seems as found locally to require less shade than the members of the *hortensis* group. This species is increasingly becoming naturalized. It is a major agricultural pest (South, 1992), not only in its native terrain, but perhaps even more in areas to which it has been introduced, including, Australia, New Zealand, the United States, and Canada.

This slug is a common dominant, in mass and numbers, in areas recently clear-cut in British Columbia, Washington, and Oregon, seemingly most common in Washington. Note that in our western Washington 38-site sample, many of which were relatively natural but including some old and recent clear-cuts, this species broadly construed (including *A. rufus* as was traditional until recently) was present at 32 of 38, ranking second or third overall of 46 taxa.

General Distribution: In its native turf, this species is fairly ubiquitous in western and central Europe, though less distributed in the south than the north (Kearney & Cameron, 1979). Some of the major introduction areas have been noted above. In the US, this taxon has been noted in the east from Connecticut, Maine, Michigan, and North Dakota; occurrences from Newfoundland and Quebec should be mentioned here also (Dundee, 1974: note that these could refer to *A. rufus* or *A. ater*). Pilsbry (1948) noted an occurrence in Portland, Multnomah County, Oregon. Hanna (1966) summarizes western reports (covering both *rufus* and *ater*). Included are Oregon sites (Rockaway, Tillamook County: Loring, 1951, Capizzi, 1960a; Salem, Marion County, Bock, 1961) and Washington sites (Seattle, King County, Chace, 1959; Puget Sound, Anon., 1959; Puyallup Valley, Doucette, 1952, 1953, Howittt, 1958,1959; Anon., 1961b). Reports of the taxon as common in western Washington and Oregon include Johanson & Brannon (1955) and Anon. (1960, 1962). California sites listed by Hanna (1966) include ones from Del Norte, Humboldt, and San Bernardino counties. Hanna (1966, p. 28) surmises that this taxon first appeared in western North America in the Puget Sound area, based upon specimens in the California Academy of Sciences received from that area in 1933. So far, reports from other than coastal western states are limited. Baxter (1987) does not report this taxon from Alaska.

Idaho Distribution: Noted rather infrequently, especially around urban areas, in northern Idaho.

Status: A serious agricultural pest requiring no protection. Note that this taxon is not yet ubiquitous (in fact, is fairly uncommon) in the survey area.

***Arion* (*Arion*) *rufus* (Linnaeus, 1758)**

Discussion: Slug large, often 15-20 cm when extended; body typically chocolate brown or brownish red, with reddish fringe along both sides; occasionally gray or white. Foot with distinctive reddish fringe along whole length of body, often with blackish reticulations as well as reddish. Similarities and differences have been discussed under *A. ater* above; this is the only taxon with which *A. rufus* is likely to be confused. Note that we follow some current European and US (*e.g.*, Turgeon *et al.*, 1998) practice in regarding this as a full species. *A. rufus* in Washington, Oregon, and British Columbia is generally milk chocolate in color, instead of reddish like many European specimens, with a prominent reddish-black fringes along both sides of the animal. These appear as a series of reticulate, often squarish granules close-up, some of which are commonly black, although the predominant color is brownish red. We have seen some US specimens, as individuals in large, normally-colored populations, in which the ground color is nearly coal black, somewhat like *ater*. But these still retained the reddish fringe; and anatomically so far were clearly *rufus* rather than *ater*. Albinistic individuals appear rare in this species, at least in the western US populations. Generally speaking, one usually finds either *ater* or *rufus*, perhaps with some other taxon such as *subfuscus*, at a site; but rarely both can occur together.

Ecology: Quite common in synanthropic settings, such as rockeries, gardens, back yard debris piles, etc. Also, feral to semi-feral in many areas, especially including recent clear cuts, where they may be phenomenally abundant and will commonly dominate the malacofauna in numbers and mass. Found in small numbers in more mature forest settings also, especially if these are relatively small remnants. This taxon is common in moist settings; but appears less likely to occupy perennially moist and seasonally unstable notic habitats, such as floodplains. It seems as found locally to require less shade than the members of the *hortensis* group.

This species is increasingly becoming naturalized. It is a major agricultural pest (South, 1992), not only in its native terrain, but perhaps even more in areas to which it has been introduced, including, Australia, New Zealand, the United States, and Canada.

In areas recently clear-cut in British Columbia, Washington, and Oregon, this slug is a common dominant, in mass and numbers. It is seemingly most common in Washington. Note that in our western Washington 38-site sample, many of which were relatively natural but including some old and recent clear-cuts, this species (as broadly construed including *A. rufus*) was present at 32 of 38, ranking second or third overall of 46 taxa.

General Distribution: The original range of this large slug included much of western and central Europe, though less well distributed in the north than the south (Kearney & Cameron, 1979). Some of the major introduction areas have been noted above. In the US, this taxon has been noted in the east from Connecticut, Maine, Michigan, and North Dakota; occurrences from Newfoundland and Quebec should be mentioned here also (Dundee, 1974: note that these could refer to *A. rufus* or *A. ater*). Pilsbry (1948) noted an occurrence in Portland, Multnomah County, Oregon. Hanna (1966) summarizes western reports (covering both *rufus* and *ater*). Included are Oregon sites (Rockaway, Tillamook County: Loring, 1950, Capizzi, 1960a; Salem, Marion County, Bock, 1961) and Washington sites (Seattle, King County, Chace, 1959; Puget Sound, Anon., 1959; Puyallup Valley, Doucette, 1952, 1953, Howitt, 1958,1959; Anon., 1961b). Reports of the taxon as common in western Washington and Oregon include Johanson & Brannon (1955) and Anon (1960d, 1962). Roth & Pearce (1984) note an occurrence at Lynnwood, King County, Washington. California sites listed by Hanna (1966) include ones from Del Norte, Humboldt, and San Bernardino counties. Hanna (1966, p. 28) surmises that this taxon first appeared in western North America in the Puget Sound area, based upon specimens in the California Academy of Sciences received from that area in 1933. So far, reports from other than coastal western states are limited.

For eastern and western US sites, see discussion under *A. ater* above; note that wide acceptance of both as distinct taxa is relatively recent. This taxon is also mostly coastal in the western US and not that common in the eastern states. Baxter (1987) does not list it from Alaska.

Idaho Distribution: Distribution of this taxon in the Western Division provinces is much as for *A. ater*. So far, we have seen this species infrequently, in some northern counties but in urban settings only. Note that it is well naturalized in western Washington, southern British Columbia, and Oregon, being perhaps most common western Washington.

Status: An agricultural pest, so far not as ubiquitous in the survey area as in portions of western Oregon and Washington. No protection should be contemplated.

Arion (*Carinarion*) *circumscriptus* Johnston, 1828
brown-banded arion

Discussion: Slug of medium length, 3-4 cm when extended; ground color dark gray to brownish above (mantle speckled with black, rather than silvery) fading to white near foot fringe; lateral stripes dark, very narrow, and coherent; somewhat weak dorsal stripe; sole white; mucus colorless; tentacles medium gray or brownish gray.

Two species are closely similar externally; *A. fasciatus* is larger; has rather narrow orange or yellow pigment bands below the lateral bands; and darker gray tentacles; *A. silvaticus* is roughly the same size; but the ground color is lighter (this is especially noticeable on the mantle); the tentacles are lighter (slivery gray); and the lateral bands are distinct and less narrow. These three taxa share a bell-shaped cross section when contracted and have colorless slime. Note that older records, particularly in the US, may well have confounded these three species.

Ecology: Catholic, according to Kearney & Cameron (1979). Wåreborn (1969) seemed to find this species most often in what he termed oligotrophic woodlands than in mesotrophic or eutrophic forests. This taxon seems well-naturalized in eastern North America (Chichester & Getz, 1973). Most introduced colonies here seem to be in typical synanthropic settings, such as debris piles, gardens, etc. However, some forest border sites in the southern Washington Cascades and southwestern Washington seem to have this taxon.

General Distribution: European generally, according to Kearney & Cameron (1979). This taxon has been introduced into other areas than North America; but few have been specifically demonstrated. Records for the *A. circumscriptus* group generally are quite common in central and eastern North America (Pilsbry, 1948; Dundee, 1974). Western records are far fewer. Hanna (1966) noted sites in Golden Gate Park, San Francisco, and in Corvallis, Oregon. Roth (1986) shows that California records properly pertain to *A. silvaticus*, not this species. The *A. circumscriptus* group seems to be absent from the Southwestern (*e.g.*, Bequaert & Miller, 1973), Rocky Mountain, and Washingtonian provinces; or at least unreported so far. Branson (1977) reports three Washington Olympics sites; Branson (1980) reports no Washington Cascades sites; Branson & Branson (1984) has no western Oregon records. This seems to be an uncommon slug as yet in Washington, present mostly in synanthropic sites so far; but possibly dominating a few southwestern Washington clear-cuts and forest border sites.

Idaho Distribution: Not recorded previously in Idaho, but seen along the Coeur d'Alene corridor; likely occurring in major towns in other counties.

Status: Adventive requiring no special protection.

Arion (*Cariarion*) *fasciatus* (Nilsson, 1823)
orange-banded arion

Discussion: Slug of medium length, 3-4 cm when extended; ground color pale gray above fading to white near foot fringe; lateral stripes dark, somewhat narrow, and coherent; somewhat weak dorsal stripe; sole white; mucus colorless; tentacles silvery gray.

Two species are closely similar externally; *A. fasciatus* is larger; has rather narrow orange or yellow pigment bands below the lateral bands; and darker gray tentacles; *A. circumscriptus* is roughly the same size; but the ground color is darker (this is especially noticeable on the mantle); has darker tentacles; and the lateral bands are distinct, but very narrow. These three taxa share a bell-shaped cross section when contracted and have colorless slime. Note that older records, particularly in the US, may well have confounded these three species.

Ecology: Catholic, according to Kearney & Cameron (1979). Wåreborn (1969) seemed to find this species most often in what he termed mesotrophic to eutrophic woodlands than in oligotrophic forests. Most introduced colonies seem to be in typical synanthropic settings, such as debris piles, gardens, etc. However, some forest border sites in the southern Washington Cascades and southwestern Washington seem to have this taxon.

General Distribution: European generally, according to Kearney & Cameron (1979). This taxon has been introduced into other areas than North America; but few have been specifically demonstrated. Records for the *A. circumscriptus* group generally are quite common in central and eastern North America (Pilsbry, 1948; Dundee, 1974). Western records are far fewer. Hanna (1966) noted sites in Golden Gate Park, San Francisco, and in Corvallis, Oregon. California records were established by Roth (1882). The *A. circumscriptus* group seems to be absent from the Southwestern (*e.g.*, Bequaert & Miller, 1973), Rocky Mountain, and Washingtonian provinces; or at least unreported so far. This seems to be an uncommon slug in Washington, present mostly in synanthropic sites so far; but possibly dominating a few southwestern Washington clear-cuts and forest border sites.

Idaho Distribution: Not recorded previously in Idaho; but seen in the Coeur d'Alene and Clearwater drainages and probably occurring in major towns elsewhere.

Status: Adventive requiring no special protection.

Arion (*Carinarion*) *silvaticus* Lohmander, 1937
forest arion

Discussion: Slug of medium length, 3-4 cm when extended; ground color pale gray above fading to white near foot fringe; lateral stripes dark, somewhat narrow, and coherent; somewhat weak dorsal stripe; sole white; mucus colorless; tentacles silvery gray.

Two species are closely similar externally; *A. fasciatus* is larger; has rather narrow orange or yellow pigment bands below the lateral bands; and darker gray tentacles; *A. circumscriptus* is roughly the same size; but the ground color is darker (this is especially noticeable on the mantle); has darker tentacles; and the lateral bands are distinct, but very narrow. These three taxa share a bell-shaped cross section when contracted and have colorless slime. Note that older records, particularly in the US, may well have confounded these three species.

Ecology: Catholic, according to Kearney & Cameron (1979). Wåreborn (1969) seemed to find this species most often in what he termed meso-eutrophic woodlands than in oligotrophic forests. Most introduced colonies seem to be in typical synanthropic settings, such as debris piles, gardens, etc. However, some forest border sites in the southern Washington Cascades and southwestern Washington seem to have this taxon.

General Distribution: European generally, according to Kearney & Cameron (1979). This taxon has been introduced into other areas than North America; but few have been specifically demonstrated. Records for the *A. circumscriptus* group generally are quite common in central and eastern North America (Pilsbry, 1948; Dundee, 1974). Western records are far fewer. Hanna (1966) noted sites in Golden Gate Park, San Francisco, and in Corvallis, Oregon. California records were established by Roth (1882). The *A. circumscriptus* group seems to be absent from the Southwestern (*e.g.*, Bequaert & Miller, 1973), Rocky Mountain, and Washingtonian provinces; or at least unreported so far. This seems to be an uncommon slug in Washington, present mostly in synanthropic sites so far; but possibly dominating a few southwestern Washington clear-cuts and forest border sites.

Idaho Distribution: Not recorded previously in Idaho; but noted in the Coeur d'Alene area and likely occurring in major towns in other parts of the state.

Status: Adventive requiring no special protection.

Arion (*Kobeltia*) *distinctus* Mabille, 1868
darkface arion

Discussion: Slug when extended 2.5-3 cm in length; body gray to blue-black above; with single indistinct dark lateral band rather low on each side and rather narrow, indistinct dorsal stripe; tentacles bluish; posterior tip also blue-black when extended; sole usually grayish-golden; mucus yellow-orange.

Two other species are superficially similar. *Arion hortensis* has a more brightly colored body (the lateral stripes are more distinct, blacker, wider, and situated closer to the dorsal margin; the dorsal stripe is wider and more distinct; the sole is often bright orange); the tentacles are reddish; and the posterior termination of the tail is orange. *Arion owenii* is typically brownish-gray with very narrow and weak dorsal and lateral stripes; the tentacles are the same color; the sole is pale gold.

Ecology: Essentially catholic, with perhaps a slight preference for calcareous or neutral soil (Kearney & Cameron, 1979). So far, it has not been seen dominating clearcuts; but may be extremely abundant locally, especially in very moist, shaded situations. Found particularly in parks, very moist rock gardens, waste piles, along roadsides and railroad grades, and in garbage dumps, mostly in strongly shaded areas. More rarely noted along forest borders.

General Distribution: Western and southern Europe as a native (Kearney & Cameron, 1979). Widely introduced through commerce, *e.g.*, into Australia, South Africa (Chichester & Getz, 1973), and New Zealand (Barker, 1979), as well as North America. In the eastern part of the continent, reported from Connecticut, Maine, Massachusetts, New York, Pennsylvania, Virginia, the District of Columbia, and the following Canadian provinces: Newfoundland, Nova Scotia, Ontario, Quebec (Dundee, 1974: for *A. hortensis s.l.*). In the western US, Pilsbry (1948) reported the following sites for the *hortensis* species complex: Seattle, King County, Washington; San Francisco Bay area, Oakland, and Niles, Alameda County, California. The Seattle reference dates from 1896. Hanna (1966), again as a species complex, reported material from Niles, Alameda County, Crescent City, Del Norte County, Santa Cruz, Santa Cruz County; San Anselmo, Mill Valley, and San Rafael, Marin County (Anon., 1962). Roth (1982) revised much of the material, with an emphasis on San Francisco Bay slugs, and recognized this species, as he did from California generally later (Roth, 1997). Not reported from Alaska by Baxter (1987). No previous reports from Oregon or from the Washingtonian Province. Not noted from the Southwestern Province by Bequaert & Miller (1973); nor from Wyoming by Beetle (1989). Reported from British Columbia by Rollo & Wellington (1975).

Branson (1977) noted 6 Olympic Peninsula (Washington) sites for the *hortensis* complex; Branson (1980) none from Cascades Washington; Branson & Branson (1984) reported two Oregon sites. We have seen specimens, confirmed by dissection, from Seattle and other places in western Washington and suspect that *A. distinctus* is widespread. Note that our 1996 western Washington samples and lower Salmon River (Idaho: see Frest & Johannes, 1995b) sites lacked this taxon. Still, there is some indication that it may be successfully naturalizing, particularly in southwestern Washington.

Idaho Distribution: Oddly, this species has not definitely been reported from Idaho. We have, however, noted specimens in this species group, not yet dissected to confirm the identification, from the Coeur d'Alene to Kellogg area. It is to be expected in urban areas or other clearly synanthropic sites. So far, the members of this species group seem not to have been as successful in establishing truly feral colonies as has *A. ater*, *A. rufus*, and A. *subfuscus*.

Status: No special status required. An agricultural pest in Europe (Kearney & Cameron, 1979) and hence potentially here as well.

Arion (*Kobeltia*) *hortensis* Férrusac, 1819
garden arion

Discussion: Slug when extended 2.5-3 cm in length; body orange to brownish-orange; with single distinct, rather wide dark lateral band rather high on each side and comparatively wide, distinct dark dorsal stripe; tentacles reddish-gray; posterior tip and fringes golden orange; sole usually deep orange; mucus bright yellow-orange.

Two other species are superficially similar. *Arion distinctus* has a less brightly colored body, especially above the lateral stripes; the latter are less distinct, less coherent, narrower, and situated lower on the sides; the dorsal stripe is narrower and less distinct; the sole is often light yellow or golden); the tentacles are bluish-gray; and the posterior termination of the tail is orange. *Arion owenii* is typically brownish-gray with very narrow and weak dorsal and lateral stripes; the tentacles are the same color; the sole is pale gold.

Ecology: Essentially catholic, with perhaps a slight preference for calcareous or neutral soil (Kearney & Cameron, 1979). So far, it has not been seen dominating clearcuts; but may be extremely abundant locally, especially in very moist, shaded situations. Found particularly in parks, very moist rock gardens, waste piles, and in garbage dumps, mostly in strongly shaded areas.

General Distribution: Western and southern Europe as a native (Kearney & Cameron, 1979). Widely introduced through commerce, *e.g.*, into Australia, South Africa (Chichester & Getz, 1973), and New Zealand (Barker, 1979), as well as North America. in the eastern part of the continent, reported from Connecticut, Maine, Massachusetts, New York, Pennsylvania, Virginia, the District of Columbia, and the following Canadian provinces: Newfoundland, Nova Scotia, Ontario, Quebec (Dundee, 1974: for *A. hortensis s.l.*). In the western US, Pilsbry (1948) reported the following sites for the *hortensis* species complex: Seattle, King County, Washington; San Francisco Bay area, Oakland, and Niles, Alameda County, California. The Seattle reference dates from 1896. Hanna (1966), again as a species complex, reported material from Niles, Alameda County, Crescent City, Del Norte County, Santa Cruz, Santa Cruz County; San Anselmo, Mill Valley, and San Rafael, Marin County (Anon, 1962). Roth (1982) revised much of the Hanna material and listed this taxon from the San Francisco Bay area; Roth (1997) includes this taxon as a California adventive. Not reported from Alaska by Baxter (1987). No previous reports from Oregon or from the Washingtonian Province. Not noted from the Southwestern Province by Bequaert & Miller (1973); nor from Wyoming by Beetle (1989). Reported from British Columbia by Rollo & Wellington (1975).

Branson (1977) noted 6 Olympic Peninsula (Washington) sites for the *hortensis* complex; Branson (1980) none from Cascades Washington; Branson & Branson (1984) reported two Oregon sites. We have seen specimens of this taxon, confirmed by dissection, from Seattle. Note that our 1996 western Washington samples and lower Salmon River (Idaho) sites lacked this taxon. Even though reported most commonly in past literature under this name, we have so far seen fewer Washington sites with it than either *distinctus* or *owenii*; and there is less indication that it may be successfully naturalizing in Washington.

Idaho Distribution: Interestingly, this species has not definitely been reported from Idaho. However, we have recently collected specimens, likely belonging to at least two of the species in this complex, in the Coeur d'Alene area and elsewhere in northern Idaho; but have not so far dissected them to confirm species identifications. It is to be expected in urban areas or other clearly synanthropic sites. So far, the members of this species group seem not to have successfully established truly feral colonies.

Status: No special status required. An agricultural pest in Europe (Kearney & Cameron, 1979) and hence potentially here as well.

Arion (*Kobeltia*) *intermedius* Normand, 1852
hedgehog arion

Discussion: Slug rather small, when extended to 2 cm. Body color grayish-yellow, bluish-yellow, or white; head and tentacles slightly darker; longitudinal and dorsal bands very weak, mostly incoherent; foot fringe usually yellow; sole often white or yellowish white with lateral edges yellow; mucus clear yellow; when contracted, dark color granules on small tubercles give prickly or hedgehog appearance.

The body color in this taxon is extremely variable; it includes not uncommon brownish and gray forms; locally, bluish forms are quite common. It is best identified by its small size and weak banding externally; or by its distinct anatomy (see Kearney, Cameron, & Jungbluth, 1983).

Ecology: Widely distributed in its native habitat: woods, hedges, gardens, & pastures, especially on poor soils (Kearney & Cameron, 1979). Locally, this species seems to be found more in synanthropic settings, such as moist gardens, debris piles, garbage dumps, and the like: but it seems more successful along roadsides, in rocky areas, and along railroad grades (*i.e.*, in comparatively open and periodically somewhat dry, highly disturbed settings) as compared to other members of the genus. This taxon appears to be becoming naturalized and has been found (rarely) even with such natives as *Prophysaon coeruleum*.

General Distribution: Native range: western Europe (Kearney & Cameron, 1979). Introduced into several countries (Chichester & Getz, 1973), including New Zealand (Barker, 1979). Dundee (1974) lists introductions into eastern North America to include Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, the District of Columbia, and Quebec. Western US records are few. This slug is not listed from Alaska by Baxter (1987); it is recorded from Vancouver, British Columbia by Rollo & Wellington (1975). It seems to have been reported from several places in California (Pilsbry ,1948; note that he does not list other than California sites at that time). While Roth (1982) did not include this taxon from the San Francisco bay area, Roth (1997) lists this species as a California adventive. Bequaert & Miller (1973) do not list Southwestern occurrences; not is it note from Wyoming by Beetle (1979). Branson (1977, 1980) did not note Washington sites, nor did Branson & Branson (1984) western Oregon sites. We did not note this species in our 1996 western Washington 38-site sample; nor in the Idaho Lower Salmon River Valley (Frest & Johannes, 1995); but both site sets emphasized relatively natural sites or clear-cuts.

This taxon is not uncommon in synanthropic sites in southwestern Washington and in western Oregon. A few sites are in mature forest where it occurs along roadbeds or rail grades, suggesting that some naturalization may be taking place.

Idaho Distribution: Known certainly from the Coeur d'Alene corridor; likely present elsewhere as well.

Status: Adventive; hence, not requiring any protective measures. As yet, seemingly relatively uncommon in the survey area. This taxon has not been observed to dominate clear-cuts, as have some other introduced taxa in the same genus.

Arion (*Kobeltia*) *owenii* Davies, 1979
warty arion

Discussion: Slug when extended 2.5-3 cm in length; body gray to blue-black above; with single indistinct dark lateral band rather low on each side and rather narrow, indistinct dorsal stripe; tentacles bluish; posterior tip also blue-black when extended; sole usually grayish-golden; mucus yellow-orange.

Two other species are superficially similar. *Arion hortensis* has a more brightly colored body (the lateral stripes are more distinct, blacker, wider, and situated closer to the dorsal margin; the dorsal stripe is wider and more distinct; the sole is often bright orange); the tentacles are reddish; and the posterior termination of the tail is orange. *Arion distinctus* is typically brownish-gray with less narrow and wider dorsal and lateral stripes, the latter situated rather low on the sides; the tentacles are the bluish gray; the sole is also weakly golden.

Ecology: Essentially catholic, with perhaps a slight preference for calcareous or neutral soil (Kearney & Cameron, 1979). So far, it has not been seen dominating clearcuts; but may be extremely abundant locally, especially in very moist, shaded situations. Found particularly in parks, very moist rock gardens, waste piles, and along railroad grades, mostly in shaded areas.

General Distribution: Western and southern Europe as a native (Kearney & Cameron, 1979). Widely introduced through commerce, *e.g.*, into Australia, South Africa (Chichester & Getz, 1973), and New Zealand

(Barker, 1979), as well as North America. in the eastern part of the continent, reported from Connecticut, Maine, Massachusetts, New York, Pennsylvania, Virginia, the District of Columbia, and the following Canadian provinces: Newfoundland, Nova Scotia, Ontario, Quebec (Dundee, 1974: for *A. hortensis s.l.*). In the western US, Pilsbry (1948) reported the following sites for the *hortensis* species complex: Seattle, King County, Washington; San Francisco Bay area, Oakland, and Niles, Alameda County, California. The Seattle reference dates from 1896. Hanna (1966), again as a species complex, reported material from Niles, Alameda County, Crescent City, Del Norte County, Santa Cruz, Santa Cruz County; San Anselmo, Mill Valley, and San Rafael, Marin County (Anon, 1962). Not reported from Alaska by Baxter (1987). No previous reports from Oregon or from the Washingtonian Province. Not noted from the Southwestern Province by Bequaert & Miller (1973); nor from Wyoming by Beetle (1989). Reported from British Columbia by Rollo & Wellington (1975).

Branson (1977) noted 6 Olympic Peninsula (Washington) sites for the *hortensis* complex; Branson (1980) none from Cascades Washington; Branson & Branson (1984) reported two Oregon sites. Note that our 1996 western Washington samples and lower Salmon River (Idaho) sites lacked this taxon. Still, there is some indication that it may be successfully naturalizing, particularly in southwestern Washington. We have seen far larger numbers of this species than true *hortensis* in Washington state.

Idaho Distribution: Oddly, this species has not definitely been reported from Idaho previously. It is to be expected in urban areas or other clearly synanthropic sites. So far, the members of this species group seem not to have successfully established truly feral colonies.

Status: No special status required. An agricultural pest in Europe (Kearney & Cameron, 1979) and hence potentially here as well.

Arion (*Mesarion*) *subfuscus* (Draparnauld, 1805)
dusky arion

Discussion: Slug medium-sized, extended length 5-7 cm; dark brown above, with weak dorsal stripe centrally and flanking single narrower dark (often almost black) bands along the sides; sole light yellow; normal mucus colorless; body mucus bright yellow or orange; brown or orange-brown pigment most concentrated above and below lateral stripes; often lacking on foot fringes; tentacles usually brownish- or orangish-gray.

As an adult, relatively easy to distinguish from other *Arion* species. Young specimens may resemble *Arion hortensis*; but that slug is generally much more darkly pigmented even when young. Specimens lacking the orange-brown upper body coloration (but still having orange mucus) are common in Washington. These may look much like *A. silvaticus* or *A. circumscriptus* when young. Even dissection at this stage may be inconclusive. See the latter two species for further comparisons.

Ecology: Another more or less catholic species in its home range (Kearney & Cameron, 1979). Blanchard & Getz (1979) indicates that the species in central North America is rather common in woodlands. In the Oregonian (Washington and Oregon) sites, this species is partly synanthropic, found in the usual garbage dumps, roadsides, etc.; but also is a dominant in clearcuts, particularly in southwestern Washington, and may occur in relatively mature forest as well; it is clearly becoming naturalized here.

This taxon has a curious history in western North America. It is not mentioned in Hanna (1966); nor does Pilsbry (1948) list western sites. Rollo & Wellington (1975) do list this taxon from southwestern British Columbia (Vancouver area). Roth & Pearce (1984) note an occurrence at Lynnwood, King County, Washington. Roth (1997) does not recognize it from California.

General Distribution: Native to Europe, especially northwestern Europe (Kearney & Cameron, 1979). The taxon has been introduced into a number of places, including Venezuela, Iceland, New Zealand, and central and northeastern North America (Chichester & Getz, 1973; Blanchard & Getz, 1979).

Idaho Distribution: So far, noted only rarely from northern Oregon, but likely present in all of the counties from the Coeur d'Alene northward.

Status: Introduced taxon and sometime agricultural pest (South, 1992); not in need of special protection.

Deroceras (*Agriolimax*) *reticulatum* (Müller, 1774)
gray fieldslug

Discussion: Slug somewhat stout even when extended; slight keel on posterior end; length to 6 cm; upper surface generally light colored (either whitish, cream, or flesh-colored), often with gray to blackish small, irregular markings scattered over body and mantle; sole tripartite; with central area gray; sides whitish or yellowish gray; slime milk white when irritated, other wise colorless; mantle with rather prominent small, partly concentric raised, fingerprint-like ridges; body with distinct tubercles; darker flecks usually in the areas between tubercles; respiratory pore rim slightly paler than mantle.

Note that this slug, like others in the family, may have melanistic forms and is darker when either very young or water-starved. The slime is distinctive; and western US specimens tend to be whitish or cream-colored; similar species are darker and smaller. This slug was long confused in the literature, even in Europe, with *Deroceras* (*Agriolimax*) *agreste* (Linnaeus, 1758). This slug is similar in size and groundcolor; but is more usually pale buff and lacks the darkish flecks. The anatomical differentiae are more reliable: see Kearney, Cameron, & Jungbluth (1982) for details. Note that *D. agreste* is much more of a mountain taxon, found in meadows, wet montane pastures, wild places, and the like, often at some elevation (Kearney & Cameron, 1979). Turgeon et al. (1998) do not list *D. agreste* as being confirmed as an introduction into the US, although it is certainly possible.

Ecology: Kearney & Cameron (1979) note that this slug seems most common in lowland areas, including agricultural land, hedges, gardens, and grasslands. US specimens occur similarly, with a distinct increase in prevalence in perennially wet areas. This slug seems to be becoming rapidly naturalized. We have encountered specimens in *Rorippa* beds associated with springs in very isolated areas, including internal drainage basins. In forests, it tends to be confined to seepy and permanently moist areas; and has been seen in mature as well as quite disturbed settings. Very frequent in synanthropic settings; and a well-known agricultural pest (South, 1992). Oddly, while non-synanthropic sites in the Washingtonian Province tend to be small and isolated, the species seems to be naturalizing very successfully in relatively undisturbed spring locales.

General Distribution: European generally (Kearney, Cameron, & Jungbluth, 1982); widely introduced; in almost all eastern states and provinces. In the West, much less well-known. Most records here are from the Oregonian Province, excepting Alaska (Baxter, 1987); examples are British Columbia (Victoria (Pilsbry, 1948 [as early as 1887]; Vancouver: Rollo & Wellington, 1975); Washington (Tacoma: Pilsbry, 1948; Cascade Springs: Pilsbry, 1948; Puget Sound: Anon., 1959; Puyallup Valley: Doucette, 1952, Howitt, 1958, Ellerton et al., 1959, Anon. 1961b; Grays Harbor County: Howitt, 1957; Lynnwood, King County: Roth & Pearce, 1984; western Washington generally: Johanson & Brannon, 1955, Howitt, 1959, Anon., 1960); Oregon (Portland, Multnomah County; Newport, Lincoln County; Corvallis, Benton County; Eugene and Ada, Lane County; Clatsop County [all Pilsbry, 1948]; Marion County: Anon., 1961a; Benton County: Crowell, 1962, Washington County: Roth, 1955; Multnomah County: Roth, 1955, Willamette valley: Every, 1959, 1962b, Anon., 1962, Capizzi, 1960b, Anon 1961b; western Oregon generally: Anon., 1960, 1962, Roth, 1955). Note the absence of historic southwestern Oregon records. Washingtonian records are far fewer, but were known to Pilsbry (1948) from eastern Washington and Oregon, as were Rocky Mountain records. Southwestern sites were few in 1973 (Bequaert & Miller, 1973). California records were frequent in 1948 (Pilsbry, 1948) and many were referenced in Hanna, 1966. Roth (1997) notes this species as a California adventive.

We have noted many records from the Washingtonian and Rocky Mountain provinces, including both isolated springs, marsh edges, and swamps, as well as synanthropic colonies. Note that early records may be difficult to evaluate due to confusion with *Deroceras agreste*; however, we have so far not seen *D. agreste* in the western US, although introductions would hardly be surprising. We are here presuming that earlier literature references to this taxon and its synonym *Agriolimax agrestis* pertain to *D. reticulatum*. Beetle (1989) records this taxon from 7 Wyoming counties. Branson (1977) lists 12 sites from the Olympics; Branson (1980), 1 site in the Washington Cascades; Branson & Branson (1984) noted it at only 2 western Oregon sites.

Branson (1977) comments that this species is common around human habitations in Washington. We have found it common from the Willamette valley to the coast in Oregon; and from Puget Sound across the Olympic peninsula to the Washington coast. This taxon is so ubiquitous in our area in disturbed settings that records are not remarkable. Note, however, that our western Washington 1996 38-site sample, mostly rather natural settings and clear-cuts, did not include *D. reticulatum*. We had only 4 occurrences in our 200+ lower Salmon River valley sites, Idaho (Frest & Johannes, 1995b). These are probably best attributed to this taxon (identified at the time only as *Deroceras* sp.).

Idaho Distribution: Quite common in many counties, particularly in synanthropic settings; but also in notic habitats generally, at least at lower elevations, including isolated springs.

Status: Essentially ubiquitous adventive, except in very dry areas; no protection is appropriate for a variety of reasons.

Deroceras (*Malino*) *panormitanum* (Lessona & Pollonera, 1882)
longneck fieldslug

Discussion: Slug medium-sized, 2.5-3.5 cm long when extended; groundcolor typically light to medium brown; sometimes with darker flecks; head and neck appearing long when extended, about 1/3 of full body length; mantle also 1/3 of full length; pneumostome border conspicuously lighter than rest of mantle, tail rather abruptly truncated; sole grayish; mucus colorless. Notable for particularly active and aggressive nature, often lashing its tail from side to side or snapping at other individuals.

The larger size, long neck, brown color, chisel-shaped tail profile, and conspicuous, pale pneumostome border distinguish this species from *D. laeve*. *D. panormitanum* is much more likely to lack blackish flecks as well. We follow Kearney, Cameron, & Jungbluth (1982) in regarding *D. caruanae* (Pollonera, 1891) as a synonym.

Ecology: According to Kearney & Cameron (1979), gardens, parks, and waste ground generally; hedges and fields near the sea.

General Distribution: Originally probably southwestern Europe; now widely distributed (Kearney & Cameron, 1979). In the US, originally known from California (Gregg, 1944; Lange, 1944; Pilsbry, 1948; Roth, 1997); also from Quebec (Chichester & Getz, 1969) and British Columbia (Rollo & Wellington, 1975). No new sites noted in the West by Branson (1977, 1980) or by Branson & Branson (1984).

Idaho Distribution: Noted so far from Coos, Curry, and central Douglas counties; likely distributed throughout, especially at synanthropic sites.

Status: Adventive, perhaps beginning to naturalize and more likely to do so near the Coast; needs no protection.

Lehmannia marginata (Müller, 1774)
treeslug

Discussion: Medium-large slug, length when extended to 7-8 cm; groundcolor usually grayish white; body has distinctive gelatinous appearance; two very dark (almost black) bands on lateral sides (sometimes broken into aligned spots); one near midline, second below midpoint on side; two dark bands on mantle forming lyre-shape; keel short, often paler than body; sole also grayish-white; mucus colorless, rather thin; slug may appear to exude water when disturbed.

Lehmannia valentiana (Férussac, 1821) is similar in size, but usually with a yellowish-gray or yellowish-violet body; slightly darker head; three dark stripes, including a central one, on the mantle; and a wide single dark

band on each side of a narrow paler dorsal stripe. *L. valentiana* is a generally terrestrial form, not arboreal. Note that Roth (1997) regards California *Lehmannia* as belonging to this species exclusively. Very small *Limax maximus* sometimes appear similar; but these tend to have the color bands broken into spots, often with three or more aligned bands along each side. The body texture is also not gelatinous.

Ecology: May be arboreal; also found on and under wood (*e.g.*, dead timber) and stones on ground (Kearney & Cameron (1979). Western US occurrences are in similar habitats, in general but not always in synanthropic settings.

General Distribution: European generally (Kearney & Cameron, 1979). Introduced into Australia and New Zealand (Quick, 1960). US introductions have been noted by Pilsbry (1948) and Dundee (1974); the latter noted its presence in a number of eastern states. Its occurrence in southern and central California had long been assumed (Pilsbry, 1948; Hanna, 1966) but Roth (1997) regards all of these records as *L. valentiana*. Hanna (1966) records the opinion that it "is probably the most widely disseminated" slug in California, being noted from Del Norte County through Los Angeles and San Bernardino counties and thorough the Central Valley. It should be noted that most records are for relatively temperate to warm climates; *i.e.*, the slug does not seen to have been found in northern Oregonian sites, such as Alaska (Baxter, 1987). Farther south in the Province, (Branson (1977) lists 2 Olympic Peninsula, Washington sites (under *Limax* (*Lehmannia*) *marginatus*). Note that our 1996 western Washington 38-site sample and Lower Salmon River, Idaho work did not turn up this species in relatively natural or recently clear--cut sites. We have, however, encountered this taxon infrequently in western Washington, western Oregon, and northern Idaho, occasionally at sites suggestive of the possibility that naturalization may be occurring.

Idaho Distribution: Noted at two sites in northern Idaho, and likely widespread there, at least at synanthropic sites.

Status: Should not be accorded any kind of protected status, even if locally rare or uncommon.

Lehmannia valentiana (Férussac, 1821)
threeband gardenslug

Discussion: Medium-large slug, length when extended to 7-8 cm; groundcolor usually yellowish-gray or yellowish-violet; body has distinctive gelatinous appearance; one broad dark (blackish) band on lateral sides (sometimes broken into aligned spots), near midline, sometimes weak , narrower second low on side; three dark bands on mantle, one median and two more lateral forming lyre-shape; keel short, often paler than body; sole also pale gray; mucus colorless, rather thin.

Lehmannia marginata (Müller, 1774) is similar in size, but usually with a whitish-gray groundcolor and brownish surface wash ; paler head; and two dark bands on each side of a narrow dorsal stripe; only two lateral bands on mantle. *L. marginata* is a generally arboreal form, not terrestrial. Note that Roth (1997) regards California *Lehmannia* as belonging to *L. valentiana*, while we regard Washington and Oregon *Lehmannia* as *marginata*, so far. *L. poirieri* Mabille is synonym, according to Kearney, Cameron & Jungbluth (1982).

Ecology: Primarily terrestrial; found on and under logs and stones on ground (Kearney & Cameron (1979), even in rather open areas. Western US occurrences are in similar habitats, not always in synanthropic settings. Many California sites appear to be on or near the Pacific Coast.

General Distribution: Native to the Iberian Peninsula; but now more widespread due to commerce. A common greenhouse slug in much of Europe; but seldom recorded as feral (Kearney & Cameron, 1979). Due to confusion with other *Lehmannia* species, the worldwide distribution of this taxon is difficult to evaluate at present, although it is likely quite widespread.

Idaho Distribution: So far noted definitely only in northern Idaho, but likely to occur elsewhere. Given the apparent warm climate and open area preferences, this taxon is more likely to occur in synanthropic settings than in forested settings.

Status: No protected status would be appropriate for this introduced taxon.

Limax (*Limax*) *maximus* Linnaeus, 1758
giant gardenslug

Discussion: Slug very large as adult, to 10-20 cm commonly; body pale brown, brownish gray, or gray, with two or three (usually 3) dark bands along each side, some or all of which are commonly broken up into spots; mantle spotted or marbled, but not striped; body texture not gelatinous; posterior keel short, about 1/3 distance from tail termination to mantle; tentacles darker than body, generally reddish-brown; sole uniform, whitish; slime sticky and colorless.

This very large slug is rather distinctive when an adult. Very small individuals may look somewhat like small *Lehmannia*; but the larger number of stripes or lines of spots along the sides in *maximus*; and the striped mantle and gelatinous body of *Lehmannia* are distinctive features. There are a number of color forms and variants in this taxon. In the western US and adjacent Canada, the spotted forms, with a sizable part of the body showing the groundcolor, seem to be most common: Pilsbry (1948) and Hanna (1966) quite adequately picture this form. This is the most common slug in the author's yard in Seattle.

Ecology: In its native range, this taxon is widespread in woods, hedgerows, and gardens (Kearney & Cameron, 1979). In western Washington, Oregon, and British Columbia, this taxon is quite abundant in rock gardens, debris piles, and grassy yards. It is apparently becoming naturalized and is now found also in secondary woods. In southern British Columbia and northern Washington, it appears to be the dominant slug in recent clear-cuts, being present in tremendous numbers. Farther south, it is at present more largely confined to obviously synanthropic habitats.

General Distribution: Native in southern and western Europe, according to Kearney & Cameron (1979). Reports from the central and eastern states and provinces are quite widespread (Dundee, 1974). Sites in the western US are less common, although there are reports from Colorado, Utah, and Arizona (Pilsbry, 1948; Bequaert & Miller, 1973). The taxon has long been known from California (Pilsbry, 1948; Hanna, 1966). Perhaps the earliest definite western US record is that of Orcutt (1890) from San Diego. Pilsbry (1948) lists one Oregon site: Salem, Marion County. Branson (1977) lists 5 Olympic Peninsula sites; Branson (1980) 4 from the western Washington Cascades; Roth & Pearce (1984) from Lynnwood, King County; and Rollo & Wellington (1975) from Vancouver, British Columbia. Note that Baxter (1987) does not report Alaska sites; nor do Branson & Branson (1984) from Oregon or Beetle (1989) from Wyoming. We have found it to be very common in southern British Columbia, western Washington, and western Oregon, essentially from the west side of the Cascades to the Coast. In northern Washington, it now occurs across the state into the Idaho Panhandle quite frequently. In southern British Columbia, it occurs east to the foothills of the Rocky Mountains and into their western flanks.

Idaho Distribution: Present commonly in northern Idaho; so far, not often seen outside of synanthropic locales here.

Status: An agricultural pest for which protected status would be inappropriate.

Milax (*Milax*) *gagates* (Draparnaud, 1801)
greenhouse slug

Discussion: Slug medium sized, 5-6 cm when extended; body usually slatey gray or black, with foot fringes lighter; mantle with darker blackish spots; dorsal keel thin, prominent, truncated at tail, usually same color as body (sometimes lighter); head and tentacles pigmented like body; sole lighter, usually pale gray; mucus white or colorless. The symmetrical shell is typical of the family Milacidae: the western US *Gliabates oregonius* has a similar shell. The grooved mantle (roughly in the shape of a forward-pointing shield) is also typical of the family.

The current common name is quite inappropriate, in that colonies in the US, *e.g.*, not to mention the native range, are not found only in greenhouses. This taxon appears to be naturalizing, at least in parts of the US. The German common name (Kearney, Cameron, & Jungbluth, 1982), Dunkle Kielnacktschnecke, which could be translated as "dark keeledslug" (as contrasted with *Milax* (*Milax*) *nigricans*, the black keeledslug, would be much better. The only really similar slug likely to be confused with this one is *M. nigricans*; indeed, it is quite possible that some US records pertain to this taxon. However, it has not been confirmed anatomically to occur in the US. *M. nigricans* is much darker (generally black); the sole is evenly brownish; and the body is evidently tuberculate, as contrasted to the rather smoothish body of *M. gagates*. In *M. gagates*, the sole is evidently tripartite, even though the color is fairly evenly pale whitish-gray; *M. nigricans* has a darker sole not easily seen as tripartite. The native *Gliabates oregonius* (*q.v.*) is also a milacid, judging by the shell, grooved mantle, and anatomy; but is seldom as black (commonly medium gray mottled with darker gray; and some specimens even oatmeal-colored, mottled with brown or gray); seems to be about 2-3 cm in length as an adult; and has the mantle extending over nearly half of the body. *Milax hewstoni* Cooper, 1872 may be this taxon, *fide* Pilsbry (1898, 1948) and Coan (1983).

Ecology: Partly subterranean and herbivorous, feeding upon roots; found in gardens and agricultural lands; but also in woods, hedges, and grassy areas near the sea (Kearney & Cameron, 1979). US colonies occur similarly, being known from yards, gardens, agricultural lands, and greenhouses. So far, there is only weak indications of naturalization, with woods colonies being rarely reported.

General Distribution: The native range, according to Kearney & Cameron (1979), was likely western coastal regions of France, Ireland, and Great Britain. In greenhouses and synanthropic sites in western Europe and the Mediterranean. Long known to have been introduced in the US. Eastern US records are from the states of Arkansas, Colorado, Kentucky, Maryland, Mississippi, New Jersey, Pennsylvania, and Virginia (Dundee, 1974). Western records, except in California, are quite sparse but include sites in Arizona (Bequaert & Miller, 1973) and Colorado (Cockerell, 1908). More coastal sites are more frequent. Pilsbry (1898) had already listed a range of Seattle to California for the probable synonym *Milax hewstoni*. Older Oregon records include those from Lake Oswego, Clackamas; Eugene, Benton; and Lookingglass Valley, Douglas counties by Pilsbry (1948). Known from Seattle from 1896 specimens. Present in California since at least 1872; and known from a number of coastal central and southern counties (Pilsbry, 1948). Hanna (1966) notes a number of similar sites, plus ones farther north (Contra Costa, Trinity, and Del Norte counties: Anon., 1962), indicating that the Trinity County site was "far from human habitation".

Idaho Distribution: So far, rare greenhouse situations only.

Status: An agricultural pest, so far not feral often in woods; no protected status appropriate.

Freshwater snails

Native Taxa

***Valvata humeralis* Say, 1829**
glossy valvata

Discussion: This is the common western US valvatid, found over much of the western US, at least east of the Cascade Mountains, and Mexico. Locally, it is sporadic over the whole state, mostly northern and southeastern; while reasonably well-distributed on the whole, it perhaps should be considered Sensitive in Idaho. A detritivore and aufwuchs feeder, at least in part; but more common on soft substrate than stony situations. Most often found in cold spring pools and streams; but occasionally in lakes. Somewhat of a cold water homoiothermophile.

Valvata sincera Say, 1824
mossy valvata

Discussion: This valvatid is not uncommon over much of the Northern US and Canada; but it becomes rather rare in the western US. In Idaho, so far seen in the uppermost Middle-Upper Snake drainage only, although it could occur in the northern part of the State as well. While it is rare in Idaho, and perhaps should be considered Sensitive here, it appears in good condition elsewhere. In the western US, it is found in lakes, large springs, and large spring-fed streams.

Fossaria (*F.*) *modicella* Say, 1825
rock fossaria

Discussion: This taxon seems to prefer cool but not very cold temperatures; it is common over the northern US and found through Idaho generally. More of a lithophile than most other *Fossaria* species; often found in shallow to very shallow situations, such as smaller drainages, stream edges; and pond and lake edges. Though found in quite shallow situations, it is not normally emergent, like *F. parva*.

Fossaria (*F.*) *obrussa* Say, 1825
golden fossaria

Discussion: The golden fossaria is widespread in the US and Canada and seems able to tolerate a range of water temperatures. In Idaho, it is found over the State, generally in seeps; smaller drainages, stream edges; or pond and lake edges. It is an aufwuchs grazer, also found on a variety of surfaces and substrates, although epiphytes are often prominent when this taxon is found abundantly.

Fossaria (*F.*) *parva* (Lea, 1841)
pygmy fossaria

Discussion: This small species occurs scattered over Idaho generally. It is found across most of the US and southern Canada. A poikilothermophile, it is often found associated with smaller drainages, stream edges; pond and lake edges. Often seen out of water or barely wetted, it is effectively almost amphibious. It seems to be mostly a detritus and epiphyte feeder, noted often from soft substrate situations.

Fossaria (*Bakerilymnaea*) *bulimoides* Lea, 1841
prairie fossaria

Discussion: This subspecies is a detritus and epiphyte feeder, mostly found in cold water habitats. While widely distributed across the northern US and Canada, locally it has been found so far more often in southern Idaho.

Preferred habitat is shallow water, found in quiet streams (smaller drainages), along stream edges; and near pond and lake edges.

Fossaria (*Bakerilymnaea*) *cockerelli* Pilsbry & Ferriss, 1906
no common name

Discussion: This subspecies is a detritus and epiphyte feeder, mostly found in cold water habitats. It is widely distributed over the northern US and southern Canada; it appears to be mostly northern in Idaho. Most often, it is found in quiet streams (smaller drainages), along stream edges; and near pond and lake edges.

Lymnaea stagnalis appressa Say, 1821
no common name

Discussion: This large lymnaeid is widespread in central and northern US and Canada; locally, it is found mostly in northern ID, although also present in the SE. It is mostly an epiphyte and macrophyte feeder and often associated with soft substrates and common macrophytes. While it seems to prefer cold water habitat, it is occasionally found elsewhere. This taxon may be present locally in large numbers, especially in late Fall. It is likely to be found in permanent swamps with open water; ponds, lakes, sloughs, or stable, quiet stream backwaters, in shallow to deep water.

Pseudosuccinea columella (Say, 1817)
mimic lymnaea

Discussion: Taylor (1981 and elsewhere) considers this species as likely native at least in parts of the western US. However, most authors regard it as Introduced from the eastern part of the continent. In any event, it is now sporadic over the state; and locally may be quite common. It appears to be a poikilothermophile; seems to feed mostly on epiphytes and emergent macrophytes; and seems to be found mostly in relatively shallow water, such as stream or lake, pond, or swamp edges, often areas that also have soft substrate, although it has been observed also on stones. The mimic lymnaea occurs over most of the US and Canada; it is somewhat sporadic in Idaho .

Stagnicola (*S.*) *apicina* (Lea, 1838)
abbreviate pondsnail

Discussion: The abbreviate pondsnail is one of a group of unusual endemic lymnaeids particularly characteristic of western US large river environments. They are not pond snails and they are mostly cold water stenotherms. Most are lithophiles; most likely never make it to the surface to gulp air during their life times (like traditional pulmonates are supposed to). For more information about these taxa, see Taylor (1977, unpub.; 1985) and Taylor & Bright (1987). Another example dealt with herein is *Stagnicola idahoensis*. This particular member is characteristic of the Columbia drainage: aside from the Columbia itself, in Idaho also the Clearwater, part of Hells Canyon, and lower Coeur d'Alene system, *i.e.*, mostly cold, oligotrophic larger streams with cobble-boulder substrate.

Stagnicola (*S.*) *elodes* (Say, 1821)
marsh pondsnail

Discussion: This is one of the most widespread snails in North America, found over most of central and eastern US, southern Canada. It is less common in the western US, where it is replaced partially by the similar *S .traski.* Apparently, this species is sporadic in ID, noted so far especially in the S. half of the State and near the eastern border; it may replace *Stagnicola traski* in SE Idaho. The marsh pondsnail is a poikilothermophile, usually an epiphyte and macrophyte feeder. In is often found in soft substrate areas, frequently shallow water, with common emergent plants and aquatic macrophytes, such as quiet streams and water bodies of all sizes, including marshes, fens, and swamps; and sometimes including ditches, even those that occasionally dry up.

Stagnicola (*S.*) *traski* (Tryon, 1863)
widelip pondsnail

Discussion: This taxon is the western Division counterpart to *S. elodes.* Its ecology is similar, except that it seems more restricted to cold water situations and to permanent habitats. Occurrence: western US generally; scattered over ID; but mostly northern. Habitats much like above, except permanent and more likely to be perennially cold. This taxon is not a lithophile and is more likely to be seen in typical pulmonate habitats.

Stagnicola (*Hinkleyia*) *caperata* (Say, 1829)
wrinkled pondsnail

Discussion: Sporadic over the State; found in much of the US and Canada; often abundant when present; primarily an epiphyte and macrophyte feeder. This snail seems to tolerate a wide range of temperature and substrate conditions, although more likely to be found in areas of soft substrate, high dissolved nutrients, and abundant macrophytes. Usually found locally in relatively low flow areas, including quiet parts of streams, swamps, marshes, ponds, and lakes, always permanent.

Physella (*P.*) *cooperi* (Tryon 1865)
olive physa

Discussion: The basic range of this taxon, one of the most common in the State, is the northwestern US; it is found throughout Idaho; often abundantly. Like most physids, this is an epiphyte and macrophyte feeder: and likely somewhat of a detritivore also. It prefers cool to cold water habitats, and may be found in a rather wide range of permanent water habitats. Perhaps more common north of central California.

Physella (*P.*) *gyrina ampullacea* (Gould, 1855)
no common name

Discussion: This often rather abundant taxon is one of the most widespread forms of *P. gyrina*; it is found over much of North America, including most of the western US; hence; over the State as well. An epiphyte and macrophyte feeder (and also likely a detritivore), as are all but a few western taxa, it seems happy in a wide range of water temperatures. This taxon also seems to inhabit a wide range of permanent and even semipermanent habitats, although quiet situations, both lentic and lotic, with macrophytes and soft substrate seem most preferred locally.

Physella (*P.*) *lordi* (Baird, 1863)
twisted physa

Discussion: The twisted physa is primarily a western US and adjacent Canada taxon, quite common and widespread in Idaho, although sporadic compared to the foregoing two taxa. It occupies the common physid ranges of trophic levels, being an epiphyte and macrophyte feeder: and likely a detritivore as well. Like others of the more or less Western Division forms, it seems to prefer cool to cold water; but occupies a wide range of cool permanent habitats; it is perhaps more common in northern and SE Idaho.

Physella (P.) propinqua propinqua (Tryon, 1865)
Rocky Mountain physa

Discussion: This is a characteristic Northwestern US taxon, which includes Idaho in its range and occurs widely here. A typical epiphyte and macrophyte feeder (and likely detritivore also), it is found more frequently in cold water situations; but occupies a wide range of cool permanent lentic and lotic habitats.

Physella (P.) propinqua nuttalli (Lea, 1864)
no common name

Discussion: As far as so far established, this physid is very similar in habits, habitat preferences, range, and environmental tolerances to nominate *propinqua*, although seldom occurring at the same site. An epiphyte and macrophyte feeder, as well as a facultative detritivore. As above, this taxon is found mostly in cold water situations (unlike many of the more poikilothermophile Eastern US taxa); and locally occurs in a wide range of cool habitats.

Physella (P.) propinqua nuttalli morph *triticea* (Lea, 1856)
no common name

Discussion: This and the next form are western regional endemics, occurring mostly from the Rocky Mountains to the cascade Range, but not often on the Pacific coast proper. While not common, this form (and the next as we ll) does seem to be found over much of the State, if only sporadically. It (and *venusta* as well) seems to be a typical western physid, with the habits and habitat and feeding preferences of many eastern physids, but perhaps less tolerance of warmer waters; found in range of cool habitats.

Physella (P.) propinqua nuttalli morph *venusta* (Lea, 1864)
no common name

Discussion: See above (under form *triticea*) for details. The two *nuttalli* forms occur rather sporadically and generally not with either nominate *propinqua*, standard *nuttalli*, or each other. Despite common occurrence separation, it is not evident as yet what microhabitat preferences locally result in segregation.

Physella (P.) virginea (Gould, 1847)
sunset physa

Discussion: While lots attributable to this species have been reported from much of the Northwest (ID to WA, S. to CA), locally it so far appears confined to western Idaho (perhaps northwestern) and is quite uncommon (it appears widespread only in western Washington [west side of the Cascade Range]). This seems a slightly cold

stenothermal taxon, with otherwise typical occurrence and habits; noted from a quite wide range of cool habitats, both lentic and lotic, although soft substrate ad the presence of macrophytes seems most typical.

Aplexa elongata (Say, 1821)
lance aplexa

Discussion: This predominantly lentic taxon is very widespread in the colder regions of North America and elsewhere (here, much of Canada and the northern US; northern Idaho specifically locally, but possible in SE ID as well (certainly present as a Holocene fossil). It is an epiphyte and possibly macrophyte feeder seemingly restricted to colder water environments. Preferred habitats often have soft substrate and emergent vegetation; and include ponds to small lakes, marshes, and fens. Note that this or similar forms are usually recorded in the Russian literature under the genus *Siberinauta*, which Taylor (1981 and elsewhere) accepts.

Aplexa elongata morph *tryoni* (Currier, 1867)
attenuate aplexa

Discussion: This also seems to be an edge-preferring taxon most found along ponded water habitats. Like the last, it is widespread in southern Canada and the northern US, although less common than the lance aplexa. The elongate form seems to occur in separate colonies and is perhaps slightly more predominant in colder habitats; it has been only provisionally recorded from Idaho but is not implausible for the State, especially the higher elevation areas and Panhandle. It appears to occur in the same habitats and is identical trophically (epiphyte and possibly macrophyte feeder; ponds to small lakes, marshes, fens),

Gyraulus (*Armiger*) *crista* (Linnaeus, 1758)
star gyro

Discussion: While this species is widespread in North America (but only south central and extreme SE Canada) and northern Europe and Asia, it is of very scattered occurrence in the West; but potentially could occur over the State. Known sites are few. It is an epiphyte feeder, preferring cold to very cold water habitats. Most US sites are in lakes and ponds. Most sites seem to include dense aquatic macrophyte stands and are characterized by soft substrates.

Gyraulus (*Torquis*) *circumstriatus* (Tryon, 1866)
disc gyro

Discussion: Widespread in southern Canada and northern US; also widespread in the State, although uncommon as compare to *Gyraulus parvus*. This is an epiphyte feeder most typical of muddy substrates, often without macrophytes but with emergent vegetation. Quite typical of seasonal habitats, such as vernal pools and ditches which dry in late summer. Has also been noted from the edges of more permanent habitats, such as some of the colder lakes and ponds, fens, marshes

Gyraulus (*Torquis*) *deflectus* (Say, 1824)
flexed gyro

Discussion: On of the most widespread planorbids over most of North America (all of Canada south to the central US); equally common over the State; often abundant when found. An epiphyte feeder, equally at home in slightly warm to very cold water. This small snail usually occurs in areas with mud substrate, high concentrations of dissolved nutrients, and dense aquatic vegetation, as long as the water is permanent. The flexed gyro is most often found in low to nil velocity situations, such as lakes, ponds, sloughs, fens, marshes, and springs.

Gyraulus (*Torquis*) *parvus* (Say, 1817)
ash gyro

Discussion: On of the most common small freshwater taxa over most of North America; equally common over the State; often abundant when found. An epiphyte feeder, equally at home in warm to cold water. This small snail usually occurs in areas with mud substrates, with or without emergent or aquatic vegetation, and can tolerate seasonal habitats as well as permanent. This seems to be one of the better examples of a eurythermic taxon. It is most often found in low to nil velocity situations, such as lakes, ponds, quieter stream portions, fens, marshes, and springs.

Menetus (*M.*) *callioglyptus* Vanatta, 1894
button sprite

Discussion: This small planorbid seems particularly characteristic of the Northwest, being found in British Columbia, Washington, Oregon, Northern California; and Idaho, particularly northern. It is usually quite common at a site; an epiphyte feeder, more or less restricted normally to cold water but noted from variety of cold water habitats, mostly quiet, and including seeps, very small to large streams, springs, lakes, ponds, fens, and marshes. Found on a variety of substrates and likely a generalized aufwuchs grazer. According to Taylor (1981), this is the proper name for the common western form, *M. opercularis* being an endemic to Mountain Lake, California and now extinct.

Helisoma (*H.*) *anceps anceps* (Menke, 1830)
two-ridge rams-horn

Discussion: While this taxon is widespread in E. and central North America (present also in much of southern Canada), it is comparatively uncommon and scattered in the West. It is also rare and scattered in ID. This epiphyte feeder lives in warmish to cold water, in a variety of permanent habitats, including ponds and lakes and streams of various sizes, on various substrates, with or without aquatic macrophytes. Idaho habitats are mostly soft-substrate, relatively quiet, and more likely to be ponds and lakes.

Planorbella (*Pierosoma*) *subcrenatum* (Carpenter, 1857)
no common name

Discussion: This is a very widespread western form occupying a position similar in ubiquity to that of the eastern form *P. trivolvis*. It lives in much of the US from the Rocky Mountains to the Pacific Coast and in the western half of Canada. This taxon can tolerate a wide temperature range but is replaced by other forms in southern California and some of the Southwest. In Idaho, mostly northern; scattered southern outliers; common. Found especially on aquatic macrophytes in areas with muddy substrates; most frequently in rather shallow water and in lower velocity settings, such as ponds, lakes, marshes, cut-offs, ditches, and sloughs (all permanent settings).

Planorbella (*Pierosoma*) *trivolvis* (Say, 1817)
marsh rams-horn

Discussion: In Idaho, mostly southeastern; but apparently with scattered northern occurrences as well. More generally distributed over much of the eastern and central US and eastern Canada. The habitat and water temperature preferences are much like those of subcrenatum, although this taxon seems able to tolerate warmer waters. Found mostly in quiet settings (all permanent) on muddy substrate, generally with common aquatic macrophyte stands. Usually does not occur sympatrically with *P. subcrenatum*.

Promenetus exacuous exacuous (Say, 1821)
sharp sprite

Discussion: While this small taxon is broadly distributed throughout much of the central and eastern US and all but the western third of Canada. In the more westerly parts of the US, it occurs only sporadically. Rare and scattered in Idaho. In most of its range, found in quite a variety of both seasonal and permanent habitats, especially with muddy substrates and often with aquatic vegetation. Most western sites so far seem to be in permanent habitats.

Promenetus umbilicatellus (Cockerell, 1887)
umbilicate sprite

Discussion: This taxon has a somewhat unusual distribution. It ranges from central southern Canada south through the Interior basin to the American Southwest and east to the Cascade Range. An epiphyte feeder, it is most often associated with mud substrates and vegetation, not necessarily permanent settings, including vernal ponds. Very sporadic in Idaho; mostly northern and SE; edges of cold springs and less permanent settings.

Vorticifex effusa effusa (Lea, 1856)
Artemisian rams-horn

Discussion: This typically Western planorbid has a peculiar distribution in parts of the lower Columbia drainage, including the Snake River, and in southern Oregon and northern California; but is absent from most large Columbia tributaries. Locally, mostly in the middle-upper Snake R.; Hells Canyon; and a few large springs in SE Idaho, It is primarily a perilithon feeder in much of its range; but is notable as an epiphytic feeder in the middle Snake as well. Mostly found in areas with cold water and stony substrate.

Ferrissia californica Rowell, 1863
fragile ancylid

Discussion: I follow Taylor (1981) in recognizing the earlier Rowell name over *F. fragilis* (Tryon, 1863). Over much of the US but only extreme SW and SE portions of southern Canada. In Idaho, over the state but sporadic. This is a cool to warm water taxon, often found on aquatic vegetation in muddy, somewhat eutrophic settings, on soft substrates, mostly in areas with little flow, such as small lakes, swamp edges, ponds, or sluggish streams. Also noted, though, from stony substrate in similar settings. This small limpet appears fairly tolerant of pollution and of

eutropification. Foremost an epiphytic feeder, especially on the surfaces of such larger plants as *Nelumbo*, *Typha* and *Scirpus*.

Ferrissia rivularis (Say, 1817)
creeping ancylid

Discussion: This from is found mostly in the central and eastern US and adjacent parts of southern Canada. In the West, it appears to be present widely, but is rare and scattered. This is especially so in the Pacific Northwest. This species prefers cobble and boulder substrate and rather more oligotrophic settings than does *californica*; but it is not a cold-water taxon and avoids the most pristine oligotrophic habitats in the West. In Idaho, it is found over the state but is quite sporadic. Mostly a lithophile aufwuchs feeder.

Introduced Taxa

Cipangopaludina chinensis malleata (Reeve, 1863)
Chinese mysterysnail

Discussion: This large viviparid snail has been widely introduced into the US as a result of the aquarium trade. It is primarily a detritivore; but has been observed feeding upon aquatic macrophytes as well; and in aquaria will feed upon an variety of plant and animal products. In the wild, it seems to be found most often in relatively quiet waters and on silt or mud substrates. It seems to be a poikilothermophile, with warm waters perhaps more conducive to survival; but not necessarily. Occurrences are quite scattered in the West so far. In Idaho, such are sporadic; but occurrences seem more common in the southern part of the State, *i.e.* the Snake River Plain, than to the north. This taxon seems fairly pollution-tolerant as compared to many natives, and has been found in ditches and warm spring pools as well as streams, ponds, and lakes. As this and several of the following taxa appear to have been raised commercially in springs and ponds on the Snake River Plain, it is perhaps not surprising that feral colonies would be reported more often from the same area.

Cipangopaludina japonicus (Martens, 1861)
Japanese mysterysnail

Discussion: This large viviparid has a history, ecology, and distribution, both in Idaho and elsewhere in the US, essentially identical to that of the Chinese mysterysnail. Another relatively common aquarium waif, again more commonly seen in the southern half of the State. This species may be more tolerant of cold waters than *malleata*, based upon limited observations, and more likely to be seen in flowing stream environments, again based on limited personal observations on western populations. Note that human impacts upon cold oligotrophic, stony substrate native streams would tend to make them better habitat for *Cipangopaludina*.

Marisa cornuarietis (Linnaeus, 1758)
giant rams-horn

Discussion: This large and colorful flat-spired snail is an aquarium favorite and another that seems to have been raised commercially in Idaho. This taxon seems to have gone feral rather less often than *Cipangopaludina*, perhaps because it is more of a warm-water taxon. Still, there are reports from various place in the southern US; and also

from southern Idaho. Like the taxa discussed above, *Marisa* seems to prefer soft substrate and relatively slower, warmer habitats. It is most likely to be reported from Snake River Plain ponds or pools.

Pomacea spp.
applesnails

Discussion: The large, inflated shells of the applesnails are also quite familiar to those who maintain home aquaria. These have been widely introduced into warmer waters of the southern US and are well established in states like Florida, which also has at least one native applesnail. A problem with identification of local examples is that various color forms have been segregated and raised separately, so that many specimens are not typical of those of wild provenance. Applesnails also seem to have been farmed in the Snake River Plain. Examples of at least two taxa have been noted feral in southern Idaho, in certain middle Snake tributaries; most likely present is *P. haustrum* (Reeve, 1858), the titan applesnail; but other taxa may be present also. Introductions into other suitable locales elsewhere in the State are possible, although the applesnails seem to prefer warmer waters (are not as broadly tolerant as *Cipangopaludina*). For this genus, soft substrates seem preferable; in the aquarium, these animals seem to eat a variety of foods, including macrophytes and vegetables, and are certainly not purely detritivores.

Tarebia granifera (Lamarck, 1822)
quilted melania

Discussion: The introduced melanids and thiarids are somewhat difficult to identify due to incomplete knowledge of the systematics of foreign forms. At least one thiarid, believed to be this taxon, seems to have been raised as an aquarium snail in Idaho (Snake River Plain) and has definitely become feral there. This taxon prefers clean water settings in warmer waters, such as warm spring pools or ponds. In Utah, it seems to be rapidly becoming widespread in such habitats, and there is a possibility that it is crowding out native hydrobiids and other snails. This may not be as big a problem in Idaho, except in those areas warm-water homoiothermophiles can be expected to thrive, such as those occupied by the Bruneau hot springsnail or *Pyrgulopsis* n. sp. 8. Noted so far in Idaho in middle Snake tributaries and southeastern ID warm springs. Most shells are most likely subspecies *mauiensis*; but other possible taxa have been seen as dead shells, including a few from the Snake River itself.

Note that all of these taxa have some possibility of becoming nuisance species; but that the more serious danger may be to spring-dwelling native endemics. In general, these taxa seem most likely to be found in degraded habitats, often human-modified, and least likely to be abundant in pristine native cold oligotrophic locales. Degraded habitats included those with warmer than typical water; soft substrate; and higher than typical dissolved nutrient concentrations. Certain of these taxa are air-breathing and hence may outcompete even some native pulmonates in habitats where dissolved oxygen concentrations are low.

Radix auricularia (Linnaeus, 1758)
big-ear radix

Discussion: This European lymnaeid snail is widely introduced over the whole State and is similarly common elsewhere in the western US. While most likely to be found in relatively quiet situations on soft substrates, often with common macrophytes, this taxon is effectively a poikilothermophile and has been noted from streams of all sizes, lakes, ponds, and springs, spring runs, and spring pools. It appears most successful in warmer areas with little current and definite nutrient enrichment; and has even been seen occasionally in cattle troughs. While often an epiphyte scraper, then species is also believed to be able to survive on aquatic macrophytes.

Note that Taylor (1981) has sometimes considered the species, at least in Alaska, native. However, its rapid spread in much of the western US in recent years suggests that it was not recently present historically.

Physella spp.
uncertain

Discussion: Along with the more showy aquarium waifs, one commonly sees physids, possibly several species, in the appropriate shops. Some of these appear to have become feral in the region and the State. Definite sites include ones in middle and upper Snake tributaries, including warm springs. At least some appear to be *Physella cubensis* (Pfeiffer, 1839); but more exotic species seem to be involved as well. It should be noted that many tropical physids can be disease or parasite vectors; but if such is an actual problem for aquarium introductions remains unknown.

Planorbella (*Pierosoma*) *tenuis* (Dunker, 1850)
Mexican rams-horn

Discussion: This taxon occurs mostly in the southern and southwestern US and Mexico. It appears to be a warm water homoiothermophile. In aquaria, primarily an epiphyte feeder; but may also consume macrophytes or other vegetable matter or detritus. Introduced into Snake River Plain smaller streams and urban ponds and warm springs; so far, rather rare and local; not spreading into the wild.

Planorbella (*Seminolina*) *duryi* (Wetherby, 1879)
Seminole rams-horn

Discussion: This species is native to a small portion of the US (Florida) but now occurs much more widely due to usage as an aquarium snail. A macrophyte and epiphyte feeder which also appears to be a warm water stenotherm. Introduced into central southern and southeastern ID warm springs.

Freshwater Bivalves

Native Taxa

Sphaerium nitidum Clessin, 1876
Arctic fingernailclam

Discussion: This medium-sized sphaeriid occurs over the northern US and much of Canada. More locally, it is found in high mountain settings and more often in northern Idaho; but appears sporadic or rare. It may also be found in large cold springs in SE Idaho. A cold water stenotherm found in lakes, ponds, streams; rarely in large cold springs. All of the sphaeriids are first and foremost filter feeders; but some may be facultative detritivores of sorts. Almost all taxa seem to be more characteristic of fine sediments, with or without macrophytes.

Sphaerium occidentale (Lewis, 1856)
Herrington fingernailclam

Discussion: This medium-sized sphaeriid is sporadic in much of extreme southern (mostly border) Canada and the eastern and central US; even more sporadic in the Pacific Northwest; and is sporadic in ID. So far, it appears

rare and sporadic in northern Idaho; condition elsewhere needs study. Usually noted from fine substrates in areas which always dry up at least seasonally, such as shallow margins of marshes, old lake beds, vernal ponds, etc. I expected it to be common on the Snake River Plain; but so far it appears absent. It seems to avoid cold-water settings, even when these dry up periodically.

Sphaerium patella (Gould, 1850)
Rocky Mountain fingernailclam

Discussion: Despite the common name, this sphaeriid is much more characteristic of the Cascade Range and Coast Range, where ir occurs from extreme southern British Columbia to northern California. Although reported from Idaho (*e.g.*, Clarke, 1981), we have not yet seen it there; and because of its scarcity in NE Washington have some doubts about Idaho occurrence. It is a cold water species, often found in larger streams and bodies of water and quite abundant when found. Substrate rather variable; sometimes in areas with no macrophytes.

Sphaerium rhomboideum (Say, 1822)
rhomboid fingernailclam

Discussion: This rather large sphaeriid is common over much of North America (southern Canada to the central US); but rather less so in the West. It is sporadic at lower elevations over the State. Found in cool to warm permanent water sites; localities are often muddy and rather quiet.

Sphaerium simile (Say, 1816)
grooved fingernailclam

Discussion: This large sphaeriid has a distribution very similar to that of *S. rhomboideum*; it is common over much of the central US and southern Canada, but not abundant in the Pacific Northwest. Locally, it is quite uncommon in northern Idaho, but occurs also on the Snake River Plain, where it may be quite abundant in the mainstem Snake River. Locally, it prefers warm to cold water larger, nutrient-rich streams and lakes, ponds, or impoundments. Found on mud to fine gravel substrates.

Sphaerium striatinum (Lamarck, 1818)
striate fingernailclam

Discussion: This large sphaeriid is common over much of the continent; but much less so in the West. It appears to occur scattered over ID, although mostly in the southern part of the State. Noted from warm to cold water locally, often in larger, nutrient-rich streams, lakes, or ponds, often warmish, on mud to fine gravel substrates.

Musculium lacustre (Müller, 1774)
lake fingernailclam

Discussion: A medium-sized sphaeriid found over most of North America and points south, as well as Europe and Asia. Very definitely a poikilothermophile. This thin-shelled taxon is found over the state and is common in a wide variety of permanent water habitats, but perhaps prefers quieter lentic settings, even very small. Quite

tolerant of periodically hypoxic locales and low pH waters. *M. raymondi* is the proper name according to Taylor (1981).

Musculium partumeium (Say, 1822)
Swamp fingernailclam

Discussion: This medium-sized sphaeriid occurs mostly in extreme southern and SE Canada and through most of the US; but is largely absent from the Southwest and rare in much of the West. Locally, it is found over the state, but is rare. It is mostly encountered in impermanent ditches, ponds, vernal pools, and the like, mostly on very fine substrate. *Musculium truncatum* (Gould, 1848) (truncate fingernailclam) is the preferred taxonomy, according to Taylor (1981).

Musculium securis (Prime, 1851)
pond fingernailclam

Discussion: A large sphaeriid, found over most of the US (except the Southwest) and the southern half of Canada; but rather uncommon in the Pacific Northwest. In Idaho, it occurs scattered over state; and is abundant in a wide variety of permanent and impermanent habitats, often on mud substrates at sites with abundant vegetation. Despite the common name, streams are as significant to this species as lentic habitats. Like several of the regionally uncommon taxa discussed above, this taxon appears to be becoming more prevalent in the nutrient-enriched and impounded areas of the Snake River.

Musculium transversum (Say, 1829)
long fingernailclam

Discussion: This quite large (relatively) sphaeriid tends toward occurrence through out the central portion of the continent but is rare to absent from the northern periphery and the coastal areas. It appears to be uncommon to rare in the West generally. Rare in northern Idaho, sporadic on Snake River Plain. Sites are mostly slow waters, including lakes, ponds, sloughs, and larger rivers locally, on mud to fine gravel substrate.

Pisidium (*P.*) *idahoense* Roper, 1890
giant northern peaclam

Discussion: In North America, this large pisidiid occurs mostly in Canada, especially the central northern, western, and northwestern portions. Sites are rare and scattered in southern Canada and small parts of the NE and NW US; the species is quite rare in ID; found scattered over state, but mostly in SE cold springs. It perhaps should be considered Endangered in the State. A very definite cold water stenotherm, often found on sand or fine gravel.

Pisidium (*Cyclocalyx*) *casertanum* (Poli, 1795)
ubiquitous peaclam

Discussion: This small taxon is almost ubiquitous in the Northern Hemisphere; and occurs, often abundantly, over the State as well. Found in warmish to cold waters, abundant in a wide variety of permanent water habitats; sometimes reported from impermanent habitats as well.

Pisidium (*Cyclocalyx*) *compressum* Prime, 1852
ridgeback peaclam

Discussion: A small taxon found over much of southern Canada and all of the US; over the State as well; common. Found in a wide variety of warmish to cold permanent-water habitats.

Pisidium (*Cyclocalyx*) *ferrugineum* Prime, 1852
rusty peaclam

Discussion: Distributed over much of Canada and the northern US; Locally, over the State. A common taxon in various permanent water habitats in cold to very cold water; often found on soft substrates with dense macrophyte stands; or in low pH settings.

Pisidium (*Cyclocalyx*) *lilljeborgi* Clessin, 1886
Lilljeborg peaclam

Discussion: Much like above in general range; most of Canada and the northern US; scattered in N. and central Idaho. This taxon is much less common than *P. ferrugineum*, however, and locally seems restricted to higher elevations. It is a strong cold water stenotherm, found mostly in permanent mountain ponds and lakes in the western US. Also occurs in Europe.

Pisidium (*Cyclocalyx*) *milium* Held, 1836
quadrangular peaclam

Discussion: Common over much of southern Canada and the northern US, including the Pacific Northwest; Uncommon to rare in Idaho but over the state. Prefers cool to cold water; locally, seen mostly in springs and small, cold streams. Also occurs in northern Europe.

Pisidium (*Cyclocalyx*) *nitidum* Jenyns, 1832
shiny peaclam

Discussion: Found over much of Canada and the US; over the state; but mostly N. and rare in Snake River Plain springs; broad distribution world-wide also (mostly Northern Hemisphere). This taxon has broad temperature tolerances on the whole; but seems locally uncommon and restricted to cold streams and lakes or ponds in northern Idaho; and to cold springs and spring-influenced streams in the south.

Pisidium (*Cyclocalyx*) *obtusale* (Lamarck, 1818)
obtuse peaclam

Discussion: I follow Kuiper (1986) in using the name *obtusale* rather than *rotundatum* for this taxon; and in recognizing the European taxon in North America, but maintaining the distinctness of *ventricosum*. See also Taylor (1981). Occurs over much of S. Canada and the northern (the border states, primarily) US, with a Rocky Mountain salient farther south; locally, found over the state, but somewhat sporadic. A cool to cold water taxon, found especially in muddy macrophyte beds in quiet areas, including ponds, lakes, springs, streams (permanent only).

Pisidium (*Cyclocalyx*) *ventricosum* Prime, 1851
globular peaclam

Discussion: Lives in much of Canada and the northern US, although less common west of the Rocky Mountains or in western Canada; over the State, but rather scattered. Very cold to cool water; uncommon in a variety of perennial habitats, but often with mud substrate and macrophyte beds.

Pisidium (*Cyclocalyx*) *waldeni* Kuiper, 1975
walden peaclam

Discussion: This comparatively recently discriminated Northern hemisphere species is found in North America in western Canada and parts of the northwestern US; the Idaho distribution is uncertain, but likely extreme northern only. This is a stenothermal taxon (a cold water homoiothermophile), rather rare, found mostly in high-elevation lakes and bogs in the US.

Pisidium (*Cyclocalyx*) *variabile* Prime, 1852
triangular peaclam

Discussion: This rather generalist pisidiid is found over much of Canada and the US; in Idaho, over the state. Often common when found; occurs in a very wide range of habitats (but all permanent) and temperatures, on various substrates, with or without macrophytes. Often abundant when found.

Pisidium (*Neopisidium*) *conventus* Clessin, 1877
Alpine peaclam

Discussion: The distribution of this taxon is very similar to that of *P. idahoense*; northern and central Canada; somewhat scattered over southern Canada and the northern US; found only at high elevations in Idaho so far. It is a cold water stenotherm, noted rarely, mostly from high-elevation and deep, cold lakes in the US. Found often in areas of soft substrate lacking macrophytes. Distributed widely in northern Europe and Asia as well.

Pisidium (*Neopisidium*) *insigne* Gabb, 1868
tiny peaclam

Discussion: Sporadic over parts of southwestern and northeastern Canada and the W. US (mostly the northern states and down the Rocky Mountain chain to New Mexico); over the state in Idaho. A cold water stenotherm,

common mostly in cold springs and cold seeps with slow flow. In some cold seeps and small spring runs may be the only sphaeriid present.

Pisidium (*Neopisidium*) *punctatum* Sterki, 1895
perforated peaclam

Discussion: Seen mostly from northern and central US and southern Canada; rather rare in the Pacific Northwest; locally, so far southern ID only; rare and scattered in the mainstem Snake River and spring tributaries; perhaps Bear River drainage as well. A cool to cold water taxon, locally found occasionally in spring-influenced rivers and larger cold springs.

Introduced Taxa

Corbicula fluminea (Müller, 1774)
Asiatic clam

Discussion: Introduced, presumably from the Philippines. This taxon has long been known from the middle Snake River but is sporadic as compared to the huge population buildups noted elsewhere. In Idaho, found especially in warmer waters in the Snake and Bear drainage and major tributaries, often on soft substrates. Not so far noted from warm springs; and rare thus far in most southern Idaho irrigation ditches and systems.

Corbicula sp.
Asiatic clam

Discussion: Introduced; distribution uncertain: see Hills & Patton, 1986. It has long obvious that at least two *Corbicula* species were introduced into North America; and that both seem to date to about the same period, perhaps 1940. They have not been well discriminated; but both are present in the Columbia River and appear to be in the snake River also.

EXCLUDED TAXA

Terrestrial snails

Cryptomastix (*Cryptomastix*) *hendersoni* (Pilsbry, 1928)
Columbia Gorge oregonian

Type locality: The Dalles, Wasco County, Oregon. Holotype ANSP 145479a. This vague type locality is typical of species founded upon Hemphill collections and unfortunate, as The Dalles has expanded considerably beyond its 1880-1920 boundaries: and other species of *Cryptomastix* occur in this area.

Description: See Pilsbry (1940, p. 866, fig. 502: 2-3, 4-6) for most complete description and illustrations. As discussed under *Cryptomastix populi* below, anatomical data and illustrations of Webb (1970b, 1990) refer to *Cryptomastix populi*, not *Cryptomastix hendersoni*. As conceived by Webb, *Cryptomastix hendersoni* is a member of *Cryptomastix s.s.* [see Webb, 1970a and Pilsbry, 1940 for anatomy of *Cryptomastix mullani mullani*, type of the genus] and not the subgenus *Bupiogona*. Our dissections indicate that this is correct. We recognize the subgenus *Bupiogona* as defined by Webb, but with *Cryptomastix populi* as type species. Full species status is due to Webb (1970b) and is accepted in Turgeon *et al.* (1988; 1998). Note that permissible courses of action under ICZN rules (ICZN, 1985) do not invalidate either species group name (that is, either *populi* or *hendersoni*). Cited as *Cryptomastix hendersoni* (Pilsbry, 1928) in Frest & Johannes (1993c).

Diameter generally 15-20 mm. Shell thin, with 5.0-5.5 whorls. Spire moderately depressed, almost lenticular [like Burch & Pearce, 1990, p. 292, fig. 179a]; suture slightly impressed. Whorls convex, slightly flattened below, with high point above center of periphery; initial whorls smooth or slightly granular. No trace of hairs, papillae, or hair scars on succeeding whorls. Remaining whorls with sporadic subdued, coarse, growth lines and rare shallow spiral lines. Aperture sublunate, slightly oblique; lip typically white-light brown, narrowly reflected except at base; barely covering part of umbilicus. Lip sometimes with vestigial basal lamella, often without; parietal vestigial or absent; no palatal. Umbilicus shallow, small, about one-tenth shell diameter. Shell semitransparent, thin, with periostracum dilute-snuff brown or yellow-brown in color; surface generally somewhat glossy. Animal light-colored, generally slightly tan with a pinkish undertone, so that shells with live animals often appear slightly orange-tan. Mantle light, with gray mottles covering no more than 50% [contrast *mullani mullani* and *mullani olneyae*, with darker (to almost black) animal and heavy black mantle mottling; or *populi*, with evenly blue-black body and mantle].

Discussion: For similar species in known range, see key to western Washington-adjacent Oregon *Cryptomastix*, **APPENDIX A** [key 1C]. Note that additional similar-appearing species of *Cryptomastix* occur in the Snake River Canyon (including Hell's Canyon), eastern Washington outside of the Columbia Gorge (*e.g.*, Yakima Canyon; various places along the Columbia River and its major tributaries), and in the Blue Mountains, Washington-Oregon. Reports of *hendersoni* from these areas appear to be erroneous, however. Pilsbry's (1928,1940) concept was based solely on shells while several anatomic entities are involved if peripheral sites are accepted. Usage here is based on morphology of specimens from the vicinity of The Dalles, the type locality, that cannot be ascribed to either *C. populi* or *C. mullani olneyae*.

Label names [sometimes *nomina nuda*] seen in collections include *Helix oregonensis* Hemphill; *Helix* (*Mesodon*) *oregonensis* Hemphill; (*Helix*) *Mesodon devia* var. *oregonensis* Hemphill. More recognizable synonyms include *Helix* (*Mesodon*) *mullani* Bland & Cooper var. *oregonensis* Ancey, 1882; *Polygyra devia oregonensis* (Hemphill) Pilsbry, 1897; *Polygyra mullani oregonensis* (Hemphill) Pilsbry, 1894; *Polygyra mullani hendersoni* Pilsbry, 1928; *Triodopsis* (*Cryptomastix*) *mullani hendersoni* Pilsbry, 1940; *Triodopsis* (*Cryptomastix*) *mullani mullani* (Bland & Cooper) Vagvolgyi, 1968 (*pars.*); *Cryptomastix* (*Cryptomastix*) *hendersoni* (Pilsbry) Webb, 1970 [not *Cryptomastix* (*Bupiogona*) *hendersoni* (Pilsbry) Webb, 1970, Emberton, 1995]. Promotion of *hendersoni* and other taxa regarded as subspecies by Pilsbry (1940) to full species by Webb (1970) is valid; but specimens used for description of *Bupiogona* are *populi*, as Webb's illustration (Webb, 1990) makes clear. See discussion in Frest & Johannes (1995a) and above.

Museum collections often contain specimens of *C.* (*C.*) *mullani mullani*, *C.* (*C.*) *mullani olneyae*, or similar undescribed species from the Blue Mountains (Washington-Oregon) or from the Hells Canyon area (Washington-Oregon-Idaho) under the name *hendersoni*.

Ecology: Low to middle elevations; riparian associate; generally near seeps and springs, sometimes in leaf litter along streams, under logs, among brush, and in basalt talus. A somewhat mesophile-weakly xerophile taxon, often seen at the base of taluses, slopes or valleys with persistent moisture in otherwise quite dry and comparatively open terrain. Occurrences near seeps or springs with *Urtica* spp., *Balsamorhiza*, *Rosa*, and *Cornus stolonifera* are frequent; other plant associates include *Mimulus*, *Rorippa*, *Clematis*, *Rhus horribilis*, *Celtis*, *Populus*, *Ailanthus*, and red-berried elder. Some sites have scattered *Pinus*. Sites need not be forested (and generally aren't, *contra* J2, 1994). The species does have a fairly strong riparian association.

Occurrence with other Gorge endemic mollusks, such as *Monadenia fidelis minor*, *Vespericola depressus*; and *Oreohelix* n. sp. 26 (Sam Hill mountainsnail) are not infrequent.

Original distribution: Portions of the central and eastern Columbia Gorge, Hood River, Wasco, & Sherman counties, Oregon, and Skamania & Klickitat counties, Washington. Records from Yakima County, Washington are possible, but we have found other species only so far. The following literature records are believed valid, although we have not necessarily been able to examine the specimens involved: Pilsbry (1940, **Oregon**: The Dalles, Wasco County; below Rufus, Sherman County [remaining sites in this work are questionable]). Note that, based on examination of living material, we construe the species less broadly than did Pilsbry (1940), so that many of the old records are regarded as invalid (Frest & Johannes, 1995a). Records for Umatilla County, Oregon, Walla Walla County, Washington, and Adams County, Idaho cited by Pilsbry (1940) and Henderson (1929a, 1936b) are another taxon. We recognize about 12 historic sites.

Current distribution: Still survives at a few sites in Klickitat County, Washington and Wasco and Sherman counties, Oregon. Most sites are in the Columbia River Gorge National Scenic Area or in Oregon state parks; we resurveyed this area in some detail in 1988-1992, with further work in 1993-1996. It is unlikely that the range or number of sites will be significantly expanded by future work.

Threats: Much of the known habitat is traversed by I-84/US 30 or Washington 14, as well as by Burlington Northern and Union Pacific Railroad tracks, all of which have disturbed and impacted preferred habitat. The area is heavily utilized for recreation, and is likely to be more so in the future, partly as a result of development of the National Scenic Area; urban expansion from Portland and in The Dalles and Hood River also threaten known sites; localities in The Dalles, for example, have very recently succumbed to urbanization and highway development. Major brush fires in 1994 also impacted sites; eastern Gorge sites are often overgrazed; roadside spraying is a problem for some colonies.

Criteria for inclusion: Riparian associate; probable occurrence on public lands; local endemic. The area of occurrence is heavily utilized for recreation, and is likely to be more so in the future; urban expansion also threatens surviving sites. Some populations certainly extirpated and others declining in recent years. Population trends (number of sites, number of individuals) are downward. This species has a specialized habitat, with many or most sites on public lands.

Recommended status: Currently, this taxon is a ROD Survey and Manage and Riparian Reserve taxon (ROD, 1994). Should be considered a Sensitive species by the Forest Service and BLM. There is sufficient recently-collected information, and recent survey work, to indicate that this species should be listed as Endangered in Washington, Oregon, and Federally, due to a combination of habitat loss, human usage of its preferred habitat, and loss of historic sites.

Frest & Johannes (1993f, Table 2) recommended listing as Threatened; but later restriction of the species' range from that accepted by Pilsbry (1940), as well as additional data on the condition of surviving colonies, caused us to upgrade our recommendation to Endangered (Frest & Johannes, 1993c), as we reaffirmed in other work (Frest & Johannes, 1995a)

References: Pilsbry (1940); ROD (1994); Frest & Johannes (1993c, f; 1995a; 1996a); Deixis collections, 1988-1997.

Oreohelix hemphilli (Newcomb, 1869)
White Pine mountainsnail

Type locality: White Pine mining district, elevation 8000', near Hamilton, White Pine County, Nevada; holotype ANSP 23060a.

Description: See Pilsbry (1939) for discussion and illustrations. Specimens from the Nevada localities, which are outside the scope of this work, are being investigated by M. Ports (University of Nevada). Of concern here are specimens in the ANSP collections ascribed to this species by Pilsbry (1939) from Lost River Range, Needle Park,

elev. 10,000-11,000', Custer & Butte counties, Idaho (Challis National Forest). These likely belong to another species; but this possibility needs to be substantiated.

Ecology: Unknown. This possibly may be one of the few hypsiphile *Oreohelix* species.

Original distribution: See above. We have not been able to relocate this site; and have not collected this species as yet in the Lost River Range.

Current distribution: Uncertain; see above.

Threats: Grazing. Phosphate mining is extensive in other southeastern Idaho Great Basin limestone mountain ranges, though not yet here.

Criteria for inclusion: Local endemic; grazing.

Recommended status: None at present; needs investigation. Likely a Sensitive species.

References: Pilsbry (1939).

Oreohelix junii Pilsbry, 1934
Grand Coulee mountainsnail

Type locality: Upper end of Blue Lake, Grand Coulee, Grant County, Washington; holotype ANSP 147014a.

Description: See Pilsbry (1934, 1939) for best description and illustration. This is a large taxon, to 25 mm diameter at 5 1/2 whorls; shell thick, strongly depressed, with slight peripheral angulation; spire very low; sutures not strongly impressed. Nepionic whorls nearly smooth initially to faintly striate. Later post nepionic whorls rounded; but last with obtuse angulation continuing to aperture. Aperture strongly oblique, rounded except at periphery commonly very slightly expanded and reinforced; slightly or not at all descending. Color bands commonly developed; often, upper whorls even purplish, lower white-grayish, with horn streaks and/or suffusion; striation patchy and generally weak; weak spiral lirae sometimes present. Umbilicus about 1/4 full diameter. Some populations lack color banding. See key 1K (eastern Washington Cascades *Oreohelix* species), **APPENDIX A**, for some cogent shell features distinguishing this from related taxa.

Discussion: A 1991 examination of the holotype (USNM 5441) of *Oreohelix strigosa strigosa* (Gould, 1843) indicates that it is identical to this species, at least in shell features. The putative type closely matches Gould's illustration, even to configuration of one damaged and repaired area. The features of the juvenile and immediate post-hatching whorls, relatively subdued striation on the adult whorls, and strongly depressed shape are all suggestive of *Oreohelix junii* and differ from the Spokane specimens used by Pilsbry (1939) as the basis for his definition of *Oreohelix strigosa strigosa*, not to mention the Idaho specimens ascribed to this taxon by Solem (1975) [for this material, see entry for *Oreohelix* n. sp. 25 below]. While this may necessitate name changes in various forms of *Oreohelix*, specifically subspecies now placed in *Oreohelix strigosa* (*s.l.*), this particular entity remains unchanged in occurrence, as there is good reason to suspect that the type locality was in the Entiat, Washington area (Smith, 1937). Searches of this area by Smith, and more recent and comprehensive searches by us, 1987-1993, indicate that there is only one species of *Oreohelix* living in the Entiat vicinity. "*Oreohelix strigosa strigosa*" citations from other locations than the distribution of *junii* cited above belong to other taxa. Pending completion and publication of our work on this species complex, it seems best to retain the basic classification and species names used by Pilsbry, which were almost always well conceived and described. Subspecies names are also generally quite robust; and would remain intact even with transference to another species-level taxon. It should be noted in this connection that subspecies in the Pilsbry treatment have generally been elevated to species in modern revisions. Examples are numerous in such genera as *Helminthoglypta*, *Ashmunella*, *Sonorella*,

Triodopsis, *Stenotrema*, *Polygyra*, and *Mesodon*. For the last four, see especially Emberton (1988, 1991, 1995); for the former two, see numerous papers by B. Roth and W. B. Miller and their collaborators. Many other examples are provided by the works of L. Hubricht: for summary, see Hubricht (1985).

Ecology: A xerophile found mostly in basalt talus and outcrops, often associated with permanent springs and seeps, generally at lower elevations along major river valleys. Surrounding vegetation is sage scrub; talus plants include *Clematis*, *Urtica*, *Rhus horribilis*, scattered grasses, and *Balsamorrhiza*. Generally, colonies have only this species; occasionally *Cryptomastix mullani olneyae* or *Allogona ptychophora ptychophora* are present also. The species is occasionally found sparingly in igneous taluses (granite or gneiss) as well.

Original distribution: Grand Coulee and a portion of the mainstem Columbia River from Wenatchee to Okanogan; Chelan, Okanogan, and Grant counties, Washington. This or a closely related form is also found rarely at a few sites in the Yakima drainage in the Ellensburg area, Kittitas County, Washington.

Current distribution: Still found in scattered colonies in portions of original area of occurrence. Some sites are on Wenatchee National Forest; Okanogan National Forest, and BLM property. Sites in the Grand Coulee area may also be on public property (Bureau of Reclamation).

Threats: Highway corridors are located preferentially in areas preferred by this species, *e.g.*, Washington 17, 151, US 97. Talus removal in this area has been extensive, both for roads and fill (ongoing) and dam construction (mostly in the past) and is ongoing. Grazing has reduced most or all known sites; urban expansion in the Wenatchee area and range fires have also taken their toll in recent years; roadside spraying for weed control is also a problem at some sites. Diversion of springs for irrigation has also removed substantial areas of habitat. Extinct colonies are not uncommon; the species is declining, due primarily to human activities. Population trends (number of sites, number of individuals) are downward.

Criteria for inclusion: Local endemic; occurrence on public lands (BLM, Forest Service); ongoing threats; declining numbers and sites.

Recommended status: This species has no special status at present. It should be considered a Sensitive species by the Forest Service, BLM, and other land management and wildlife agencies. Federal and State (Washington) listing as Threatened is appropriate for the reasons just cited (see also Frest & Johannes , 1995a). The species' range has been surveyed previously (*e.g.*, by J. B. Henderson), and more recently by us (see references below). It is unlikely that many additional sites will be found.

References: Pilsbry (1934, 1939); Henderson (1929, 1936b); Frest & Johannes (1995a); Deixis collections, 1987-1997.

Freshwater snails

Physella (*Physella*) *columbiana* (Hemphill, 1890)
rotund physa

Type locality: Lower Columbia River at The Dalles, Wasco County, Oregon. Synypes in CAS collections (58939, 58940, 58941); other Hemphill specimens in UCM (21826) and ANSP (32940, 32941) collections. See Wu & Brandauer (1982) for UCM types. See Coan & Roth (1987) for CAS specimens.

Description: See Hemphill (1890a) and Te (1978) for description. The best illustration is that of Burch (1989, fig. 639). The rather large (10-12 mm; 4 1/2 whorls, rotund, solid shell, prominent growth lines, and reddish apertural callus are distinctive.

Discussion: Burch (1989), like essentially all other authors, credits the species to Hemphill (1890a). Coan (1985) and Coan & Roth (1987) credit the species to Keep, as Keep (1887) marks the first description. The name, which Coan & Roth (1987) consider at that point a *nomen nudum*, first appeared in a Hemphill catalogue (Hemphill, 1881). This may be technically correct (ICZN, 1985), even though the name originates with Hemphill; Keep's specimens came from Hemphill; Keep was not a taxonomist; Keep (1887) is not a taxonomic work but a popular work listing what Keep evidently thought were described species; and Keep himself ascribed the species to Hemphill. The first description occurs in Keep (1887), even though it is so brief as to be difficult to recognize the species. If the description is inadequate, then Keep's use of the name at best creates a *nomen dubium*, and traditional usage is correct. The critical question, if the description is accepted as adequate, is its source. If it derives from Hemphill (*e.g.*, a letter or the ms. later published as Hemphill (1890a)), then publication is the only addition to the name; and it should therefore be credited to Hemphill as Hemphill in Keep, 1887 under the provisions of Article 50 (ICZN, 1985). We regard the description in Keep (1887) as inadequate.

Ecology: Nothing certain in the literature. A large-river physid, probably restricted to relatively pure, deep, well-oxygenated water. Found on undersides of rocks associated with *Juga* (*Juga*) *plicifera* and *Fluminicola* sp. at one site, in areas normally covered by several feet or more of water. Substrate preference likely gravel-boulders. Low elevations only. This species is likely a lithophile and perilithon grazer.

Original distribution: Probably endemic to the lower Columbia River, likely from The Dalles to its mouth: Wahkiakum, Cowlitz, Clark, Skamania, and Klickitat counties, Washington and Clatsop, Columbia, Multnomah, Hood River, and Wasco counties, Oregon. About half of the range is in the Columbia River Gorge National Scenic Area. For map of well-verified localities, see Taylor (1985a). Burch (1989) and Te (1978) accept scattered records of this species from western Wyoming and Montana west to Washington and Oregon in a few major Columbia Basin streams. Taylor (1977, unpub.; 1985a) accepts only lower Columbia River records. We concur with Taylor. Even were the Wyoming and Montana records accepted, they are very few, all in rivers subject to much the same problems as the lower Columbia River.

Current distribution: Uncertain; could be extinct. This species is one of several likely driven to extinction or near extinction, either throughout their range or in a major part of it, from BPA dams and their effects. The others are *Vorticifex neritoides*, *Fisherola nuttalli*, *Fluminicola columbiana*, *Anodonta californiensis*, *Anodonta wahlametensis,* and an undescribed *Pyrgulopsis* (n. sp. 6; see Frest & Johannes, 1995a). We know of no recent records for *columbiana*. However, some rocky habitat does survive in limited areas, and survival of *Fisherola nuttalli* has recently been confirmed. Several lots in museum collections were examined by us in 1991. The references to occurrences in Wyoming and Montana in Burch (1989) derive from Te (1978) and are incorrect, in our opinion. Only lower Columbia River specimens closely match the type specimens. Recent studies of Lower Columbia River benthos sponsored by the Lower Columbia River Bistate Commission (Tetra Tech, 1991-1993, 1993) did not find this taxon in habitat now typical of the lower Columbia River.

Threats: Impoundments; continued siltation and other impacts on the few remaining sites with habitat characteristics approximating pre-impoundment conditions on the lower Columbia. Harbor and channel "improvements" in the vicinity of Portland, The Dalles, and John Day Dam; nutrient enrichment of the lower Columbia due to agricultural run off.

Criteria for inclusion: Local endemic; possible occurrence on public lands; riparian associate; extensive recent modification of nearly all of the known habitat.

Recommended status: Currently has none. It should be considered a Sensitive species by the Forest Service, BLM, and other land management and wildlife agencies. Between surveys concentrated specifically on the lower Columbia and more general surveys of the Columbia River, (see, *e.g.*, Neitzel & Frest, 1993 for

summary), there is certainly enough recent survey information to confirm that this species should be Federal and State (Oregon and Washington) Endangered.

References: Taylor (1985a); Deixis collections, 1988-1991.

GLOSSARY

[For other terms, see Arnold (1965)]

adnate (adj.) Barely attached to or in contact with; refers generally to contact of last whorl with preceding one. See **appressed**.

alate (adj.) Wing-shaped.

amnicole (n., adj.) Organism living only in or preferring stream environments; stream dweller.

amniphile (n.) Preferring stream environments; river-dweller by preference; **amniphilic** is the adjective.

angular, angulate (adj.) Having an angle (or having the tendency to form an angle), rather than a round contour.

appressed (adj.) Well-attached to or clearly in contact with; refers generally to contact of last whorl with preceding one. See **adnate**.

aperture (n.) The opening of a snail shell, through which the body protrudes when the snail is active (Burch & Pearce, 1990, fig. 9.3).

atrium (n.) The portion of the lower reproductive tract in pulmonate land mollusks situated between the external genital pore (*q.v.*) and the junction of the penis and vagina (Burch & Pearce, 1990, fig. 9.3).

aufwuchs (n.) The organic coating on stones or other underwater surfaces in permanent water bodies; consists of diatoms, protozoans, small algal epiphytes; fungi; and bacteria. The major food resource for lithophile taxa, and for **perilithon** and **periphyton** feeders (*q.v.*).

basal (adj., n.) That part of shell peristome opposite the apex; a tooth or lamella located in that portion of the shell aperture. As regards the natural life position, the base is the anterior end. When held with the apex directed upward, the base is the bottom of the shell.

basal crescent (n.) Depressed area of, or immediately adjacent to, columella, often crescent-or wedge-shaped, generally with closely spaced prominent growth lines or striae. Used in regard to shells of Hydrobiidae and related freshwater snail families.

bipectinate (adj.) Branched on two sides in a plane; feather-like; refers to gill filaments of **pseudobranch** (*q.v.*) in certain freshwater snail groups.

bipectinate gill (n.) Feather-like true gill or **pseudobranch** (q.v.) of some freshwater snails.

broadly conic (adj.) Shell conic, as wide or wider than high.

calciphile (n.) A species requiring relatively large amounts of free calcium ions for its shell or for other physiology- or metabolism-related reasons; used here for certain land snail and slug species; there are calciphile plants as well.

caudal horn (n.) Small, horn-shaped projection or protuberance at posterior end of snail, above mucus pore or anal opening (anus).

cephalic tentacle (n.) Either of the pair of elongate, flexible organs on the top of the head (base of the snout) of certain freshwater snails; generally with an eye near the lateral base, borne on a more or less distinct lobe.

collabral (adj.) Parallel to the lip of a snail shell. Refers to shell sculpture such as ridges, growth lines, or ribs. Sometimes the alternative "transverse" is used (Burch & Pearce, 1990, fig. 9.3). Another commonly seen older synonym is the term "axial".

columella (n.) The internal column around which the whorls revolve; the axis of a spiral shell; especially the exposed expression of this structure on the last whorl. The adjective is **columellar**.

compressed (adj.) Appearing flattened; relatively plane as opposed to convex: applied to shell whorls, the body whorl specifically, or the shell base.

concentric (adj.) Having bands, lines, or the like disposed in even increments around the same center of origin; refers to operculum morphology.

conic, conical (adj.) Said of a shell having approximately the shape of a cone, *i.e.*, tapering evenly from a wide, circular base to a point.

crenocole (n., adj.) Obligate spring dwelling or dweller.

crenophile (n., adj.) Preferring to live in springs; snail with such a preference; **crenophilic** is the adjective.

crenulated (adj.) Notched or scalloped in outlined.

crescentic (adj.) Having the shape of a crescent moon; applied to aperture or lamellar shape.

crest (n.) In pupillid and other land snails, a thickened area of the shell immediately or closely behind the shell aperture.

crustose (adj.) Having a crust of irregular, granular deposits of shell material; refers more specifically to the margin of the mature shell lip in some Haplotrematidae (*e.g.*, *Haplotrema voyanum*).

deflected (adj.) Bent downward from the preceding growth trajectory; most often refers to the final portion of the last whorl of some snail shells.

depressed (adj.) Flattened dorso-ventrally (from apex to base); see Burch & Pearce, 1990, fig. 9.5d; often used in combination with other adjectives describing shell shape (see next entry).

depressed conic (adj.) Conic shell depressed dorso-ventrally or postero-anteriorily; more specifically, with an apical angle of about 100° (see Burch, 1989, fig. 5e).

detritivore (n.) Aqueous taxon feeding on organic particles in sediment.

disjunct (adj.) Refers to whorls or portion of shell not in contact with preceding whorls (portion of shell); detached; loosely coiled shell, wholly or in part, with the whorls not touching one another.

edaphic (adj.) Pertaining to soil conditions, such as composition, pH, zone, etc.

elongate conic (adj.) Conic spire with an apical angle of about 30° (see Burch, 1989, figs. 4a, 5b).

epiphallic caecum (n.) A slender, more or less elongate, blind sac borne on the **epiphallus** (*q.v.*) in some pulmonate snails. Also sometimes called "flagellum" (Burch & Pearce, 1990, fig. 9.194a, b).

epiphallus (n.) In many pulmonate land mollusks, the portion of the male reproductive between the vas deferens and the penis (Burch & Pearce, 1990, figs. 182b, 9.184a); not everted in copulation.

epiphyte (n.) A (small) organism living attached to a (larger) substrate particle or other organism; **epiphytic** is the adjective.

eucrenic (adj.) Well-watered; having large numbers of springs and streams.

eurythermal (adj.) Preferring or adapted to a broad temperature range, in contrast to **stenothermal** (*q.v.*).

excentric (adj.) Not placed in the center; refers most often to the nucleus of an operculum.

external genital pore (n.) The hole by which the reproductive system reaches the exterior of the animal. In many pulmonate land mollusks it is located on the right side of the body, posterior to and slightly below the right **ocular tentacle** (*q.v.*).

genotype (n.) Formally designated type species of a genus-level taxon.

globose (adj.) Shaped like a sphere, *i.e.* with equal width and height and broadly rounded sides (see Burch, 1989, fig. 4c).

globosely conic (adj.) Conic spire with an apical angle of about 70° (see Burch, 1989, fig. 5d).

heliciform (adj.) See **helicoid**.

helicoid (adj.) Shaped like a *Helix*; refers to shell shape; in the form of a low, three-dimensional spiral, with somewhat depressed spire and whorls regularly increasing in diameter (Burch & Pearce, 1990, fig. 9.6a).

helocrene (n.) Spring in a marsh; often an opening with colder water in a more extensive, warmer *Typhus*- or *Scirpus*-covered marsh.

holotype (n.) Formally designated type specimen for a species-level taxon, as established at the time of the original description or by valid subsequent action.

homoiothermophile (n.) Preferring or adapted to a relatively even or unchanging temperature regime: see **poikilothermophile** (*q.v.*).

hypsiphile (n.) Taxon restricted to or liking high elevations: refers to certain land and freshwater mollusk taxa; **hypsiphilic** is the adjective.

imperforate (adj.) Having no umbilicus, either due to appression of inner whorls along the shell axis, leaving no central axial cavity; or having such a cavity but in adult shells with a callus or reflected columellar lip completely covering the opening (Burch & Pearce, 1990, fig. 9.10a).

inflated (adj.) Appearing swollen; strongly convex as opposed to flattened; applied to shell whorls generally, the body whorl in particular; or the shell base.

insolation (n.) The amount of sunlight striking the ground.

lamella (n.) [pl. **lamellae**] A calcareous plate, blade, tooth, or scale-like structure on a snail shell; most often refers to such structures located in the shell aperture (Burch & Pearce, 1990, fig. 9.49), particularly those occurring on the parietal (q.v.) and columellar or basal apertural sides, those on the outer (or palatal) sides being termed "folds" or "plicae" (Burch & Pearce, 1990, fig. 9.47, 9.49). In the Pupillidae and similar families, the lamellae (or teeth) or termed parietal or angular, subangular; columellar; basal; and palatal(s) respectively (Pilsbry, 1948, fig. 469; Burch, 1962, fig. 83).

lamellar (adj.) Acutely rounded as opposed to broadly rounded; plate-, blade-, or scale-like; generally applied to ribs, lirae, or other shell sculptural structures.

lappet (n.) A fold, small flap, lobe, or loose hanging portion; generally applied to the lip of a shell.

lectotype (n.) A subsequently designated holotype.

lentic (adj.) Living in standing water, especially a lake or pond.

lenticular (adj.) Having the shape, in lateral view, of the cross-section of a convex lens, *i.e.*, broadly convex above and below and angulate at the sides (Burch & Pearce, 1990, fig. 9.169c).

limnetic (adj.) Of or pertaining to lakes; living in lakes.

limnocole (n.) Organism restricted to or preferring lake environments; lake dweller.

limnocrene (n.) Spring pool, with or without outlet; generally used for rather large pools.

limnophile (n.) Preferring lake environments; **limnophilic** is the adjective.

lineolate (adj.) Marked with minute lines.

lirate (adj.) Ornamented with sharp, raised threads, marked with parallel grooves or ridges; having thread-like sculpture (**lira**, pl. **lirae**).

lotic (adj.) Living in flowing water, particularly a permanent stream or spring run.

maculate (adj.) Having irregular-shaped spots of contrasting color.

madicolous (adj.) Occurring on the wetted perimeter of a water body, but not in it: amphibious.

malleation (n.) A shell surface sculpture in which the shell bears numerous small, rounded dents, *e.g.*, as in hammered aluminum ware. Individual malleations may be sparsely to densely distributed.

mantle (n.) A fleshy tunic; a membranous covering of a mollusk that secretes the shell from marginal glands and provides the periostracum; pallium.

meatus (n.) The opening of a duct, especially the opening of the seminal duct in the verge (*q.v.*), which may be either terminal or slightly subterminal in position.

mesic (adj.) Having moderate amounts of available water or moisture; as many shaded, forest habitats; compare **xeric** and **notic** (*q.v.*)

mesophile (n.) A species tolerant of or requiring relatively moist [but not extremely moist] conditions for at least part of its life, such as occur in forests or other areas shielded from continual insolation. The adjective is **mesophilic**.

metasedimentary (adj.) Rock type of difficult to characterize lithology derived from the metamorphosis of a sedimentary unit.

monospecific (adj.) Single species; used in three senses: 1) a genus with but one species; 2) a species assemblage or community with but one species; 3) a genus (genera) with one species present in a given assemblage or community.

monotypic (adj. Having a single species-level taxon; generally applied to a genus.

mucronate (adj.) Terminating abruptly in a short sharp point or spine.

mucus bulbs (n.) Paired, bulbous swellings on the two mucus gland ducts that lead from the dart sac to the mucus glands in the family Helminthoglyptidae (Roth, 1988, fig. 7; Burch & Pearce, 1990, fig. 9.326b [but labeled as "mucus gland bulbs"]).

multispiral (adj.) Refers to an **operculum** (*q.v.*) in which there are numerous, very slowly enlarging whorls, spirals, or coils. Compare **paucispiral**; **concentric**; **excentric** (q.v.).

nasmode (n.) A set of nearby, generally large springs deriving from a common source; spring complex; spring family.

nasmodic (adj.) Having large numbers of springs.

neanic (adj.) Those whorls of a snail shell that develop after the snail hatches from its egg; post-embryonic whorls. Embryonic and neanic whorls often differ conspicuously in sculpture (*e.g.*, Burch & Pearce, 1990, fig. 9.44).

neotype (n.) Holotype designated later to replace a lost holotype.

neritiform (adj.) Shaped like *Nerita*; *i.e.* subglobose or hemispherical, with few, rapidly enlarging whorls, very reduced spire, and a heavily callused and expanded parietal apertural margin.

node (n.) A knob or swelling; generally on the outside shell surface or aperture periphery.

nomen dubium [pl. ***nomina dubia***] (n.) A species-level name of questionable validity.

nomen nudum [pl. ***nomina nuda***] (n.) A name first published without adequate description or otherwise defective according to ICZN rules.

notic (adj.) Relatively moist; with much available free water; as habitats around swamps, marshes, lakes, or other permanent waters. Compare **xeric** and **mesic** (q.v.).

notophile (n.) A species tolerant of or requiring very moist conditions for at least part of its life, such as occur alongside permanent streams, seeps or springs; used here for certain land snail and slug species. The adjective is **notophilic**.

ocular tentacle (n.) Either of the upper pair of the two pairs of elongated, flexible organs on the head of certain snails and slugs, bearing an eye at the tip; other equivalent terms are "superior tentacle" , "ommatophore', or "eyestalk"; compare **cephalic tentacle** (*q.v.*).

operculum (n.) A horny (corneous) or calcareous plate borne on the posterior foot of the prosobranch freshwater and certain land snails, which closes the aperture when the snail withdraws into its shell.

palatal (adj., n.) Outer lip or tooth or lamella in this area; that portion of the lip between the parietal wall and the basal lip; term used particularly for pupillid and related land snails.

pallial tentacle (n.) Simple tubular-shaped projection or fleshy process produced by the mantle in certain mollusk groups (*e.g.*, the Valvatidae), possibly either respiratory or sensory in function.

paralectotype (n.) A subsequently designated paratype.

paratype (n.) All members of the type suite for a species-level taxon, other than the holotype.

parietal (adj.) Pertaining to the inside wall of the shell aperture, *i.e.*, that portion in contact with the preceding whorl ; that part of the shell aperture formed over or representing the outer wall of the preceding whorl (Burch & Pearce, 1990, fig. 9.3). A lamella developed on this wall is called a **parietal lamella**: also termed **parietal tooth**.

paucispiral (adj.) Refers to an **operculum** (q.v.) with relatively few whorls, spirals, or coils.

pelophile (n.) Preferring muddy environments; **pelophilic** is the adjective.

perforate (adj.) Having a narrow but distinct umbilicus; compare **rimate**.

perilithon (n.) Those organisms growing on stones; usually refers to the smaller (near to microscopic, and consisting of just one or a few cells per individual) and inconspicuous epiphytic algae, diatoms, protozoans, bacteria and fungi, rather than to larger organisms or plants; **aufwuchs** (q.v.), in part.

periostracum (n.) The thin, proteinaceous outer shell layer, most likely to be pigmented.

periphery (n.) The edge of the shell as seen in outline view (see Burch & Pearce, 1990, fig. 9.7); there are specialized terms for several commonly-seen periphery shapes.

periphyton (n.) Those organisms growing on submerged stems and other parts of aquatic macrophytes; usually refers to the smaller (near to microscopic, and consisting of just one or a few cells per individual) and inconspicuous epiphytic algae, diatoms, protozoans, bacteria and fungi, rather than to larger organisms or plants; **aufwuchs**, in part.

peristome (n.) The thickened rim or lip around the mouth; the lip or margin of the aperture of a spiral shell. The part of the shell surrounding the **aperture** (*q.v.*).

phreatic (adj.) Of or pertaining to groundwater crevices; living in underground waters.

pilaster (n.) A fleshy ridge, especially oriented longitudinally, within the penis.

plication (n.) Small fold or corrugation that affects the whole shell but does not thicken it.

pneumostome (n.) The opening to the pulmonary cavity, specifically in pulmonate snails.

poikilothermophile (n.) Tolerant of or adapted to a relatively varied temperature regime; as contrasted to **homoiothermophile** (*q.v.*).

potamon (n.) The downstream portions (lower reaches)of a river system, often characterized by considerable yearly temperature fluctuations, more variable and lower dissolved oxygen, less coarse substrates, and weaker bottom currents. See **rhithron** (*q.v.*) also.

protoconch (n.) That portion of the shell of a freshwater snails that is developed in the egg, prior to hatching; also termed embryonic whorls. Ornament and other morphological features of this portion of the shell often differ from those of later (post-embryonic) whorls (**teleoconch** or **neanic** (*q.v.*) whorls).

pseudobranch (n.) A false or secondarily-derived gill; a vascularized fleshy outgrowth near the opening of the pulmonary cavity (**pneumostome**) of aquatic pulmonate snails, which aids in respiration. Not a true ctenidium.

pupilliform (adj.) Shaped like a small pupa or cocoon; refers to a common shell form in the Pupillidae and families with similar shell morphology.

regolith (n.) The parent rock from which the soil in an area is derived; or that lithology most influencing edaphic conditions.

reflected (adj.) Turned back; refers to edge of **peristome** (*q.v.*) or lip.

retractive (adj.) Oriented opposite of the direction of coiling.

revolute (adj.) Rolled back; refers to edge of **peristome** (*q.v.*).

rheocrene (n.) A flowing spring or spring run.

rhithron (n.) The upstream (headwaters) portions of a river system, often characterized by comparatively high dissolved oxygen concentrations, comparatively low temperatures with less yearly fluctuations, coarse substrates, and strong currents. Contrast with **potamon** (*q.v.*).

rimate (adj.) Having a very narrowly perforate umbilicus; barely umbilicate.

rugae (n., pl.: singular **ruga**, seldom seen) Convex, usually **collabral** (*q.v.*) undulations of the shell surface, roughening it but not as prominently as do ribs. **Rugae** in cross section appear as outward shell undulations, rather than actual thickenings (ribs, lirae (*q.v.*)).

rugate (adj.) having a rough or rough-appearing surface.

s.l. (adv.) Abbreviation for *sensu late* [Latin], in the broad sense; loosely speaking.

s.s. (adv.) Abbreviation for *sensu stricto* [Latin], in the strict sense; strictly speaking.

sinulus (n.) A dent or invagination in the palatal wall of the aperture; used especially for pupillids.

solid (adj.) Firm, substantial, as opposed to delicate or thin; said of shell thickness or aspect.

spiral (adj.) Coiling around a central axis; coiled around a central point and continually receding from it, with or without concomitant lateral translation; applied to shell form generally, and also to shell sculptural features such as ribs or striae; as opposed to "**collabral**" (*q.v.*) or "transverse"

spire (n.) The whole series of whorls of a spiral shell, excepting the last.

stenothermal (adj.) Preferring or adapted to a narrow temperature range. Contrast **eurythermal** (*q.v.*).

striae (n., pleural; singular **stria** [rare]) A narrow superficial groove or fine furrow on the outer shell surface (Burch & Pearce, 1990, fig. 9.13). Properly refers to negative features only, although sometimes mistakenly used for positive sculptural features, such as fine lirae or ribs, raised above the shell surface.

subangulate, subangular (adj.) Refers to a shell **periphery** (*q.v.*) in which the conjunction of the top and bottom [=upper and lower] shell surfaces as seen in profile [=side] view is a rounded angle.

sulcus (n.) A relatively broad, shallow furrow on a shell surface.

suture (n.) The line of junction or seam along which two hard structures join; a continuous spiral line marking the junction of whorls in a gastropod shell.

thermicole (n., adj.) (Organism) living only in or preferring warm spring environments.

thermopile (n.) Preferring warm spring environments; **thermiphilic** is the adjective.

tumid (adj.) Swollen in appearance; broad as contrasted to slender; used in reference to shell whorls generally, the body whorl in particular; or the shell base.

umbilicus (n.) An indentation or cavity or a circular depression at the axial base of a spiral shell; the hollow formed in spiral shells when the inner side of the volutions do not join; the central opening or cavity along the axis of the shell when the inner whorl sides are not appressed (see Burch & Pearce, 1990, fig. 9.3). The adjective is **umbilicate**; other terms describe relative size or proportions more specifically, *e.g.* **rimate, perforate**, etc.

varix (n.) A **collabral** (*q.v.*: transverse) thickening of the inner or outer wall of a shell. The term is generally limited to a structure that occurs once or a few times during shell growth, as contrasted to regular, closely repeated ribs or striae; often, the term is limited further to rather coarse or large-scale thickenings.

verge (n.) 1) In freshwater snails, particularly Hydrobiidae, the external expression of the male genital system, consisting of a penis (with vas deferens) and sometimes of various other associated lobes, ducts, glands, or some combination; 2) in certain land snails, a protuberant copulatory structure at the summit of the penis, ranging from a short, stubby process to an elongate, finger-like structure. The seminal duct is enclosed within it, with the opening (**meatus**, *q.v.*) either terminal or subterminal.

xeric (adj.) Relatively dry; with relatively little available moisture; as, desert or semidesert areas: compare **mesic** and **notic** (q.v.).

xerophile (n.) A species tolerant of or requiring relatively dry (arid or semiarid) conditions for at least part of its life; used here for certain land snail and slug species. The adjective is **xerophilic**.

For another recent and useful **GLOSSARY**, see Frest & Johannes (1999c).

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